MICROVITEC

SERVICE MANUAL

FOR

COLOUR MONITORS

WITH

SERIES-4 CHASSIS

AND

SERIES-5 CHASSIS

MODELS

CM 120mV

1431 DS4F

1214529NS3

1431 MS4F

GP0097AA0

INTRODUCTION

SERIES-4 AND SERIES-5 COLOUR MONITORS

In general, circuitry for SERIES-4 and SERIES-5 Colour Display Monitors is very similar.

Principal differences are mainly in the constructional methods employed and interface circuitry provided.

Consequently, the service information provided for SERIES-4 monitors may, in main detail, be applied also to SERIES-5 monitors.

Major Differences

Major differences are as follows:-

SERIES-4 monitors comprise a single main circuit board with a separate tube base and video amp board, plugging directly into the CRT Base.

SERIES-5 monitors utilise separate PCBs in a modular form of construction and with the interface circuitry contained on a separate PCB assembly.

Printed circuit board assemblies forming the complete SERIES-4 monitor comprise the following:-

1) Main chassis PCB assembly incorporating switch-mode power supply, driver, deflection and TTL interface circuitry.

2) Tube base and video amp, circuit board assembly.

Printed circuit board assemblies comprising the complete modular assembly for the SERIES-5 monitors are as follows:-

1) Switch-Mode Power Supply Unit assembly

2) Main driver/deflection board assembly

3) Tube base printed circuit board assembly

4) Analog-Interface PCB assembly

All assemblies are interconnected by a number of individual wiring-harness lead-sets, appropriate to the particular model and chassis Series.

SERVICE INFORMATION

To enable quick access to Service Information and to promote the efficient servicing of Microvitec Colour Display Monitors, the contents of this Manual are divided into sections.

Each of these sections is equipped with its own 'tab index' divider card — each with an appropriate heading for the information provided. Reference should be made to these headings for information access.

SAFETY STANDARDS

We recommend that when servicing these products, you observe in particular the section on 'SAFETY STANDARDS'.

IMPORTANT: Failure to observe the points noted in this section could affect your own safety, the product's safety and ultimately, that of the user.

SPECIFICATIONS

This section, in general specifies the performance parameters of models in the SERIES-4 and SERIES-5 range of colour monitors and may be used for general reference.

As new or different models are introduced into the range, other detailed performance specifications may be issued separately, either as 'Model Supplements' intended to be located at the back of this Manual, or as a separate brochure and 'Model Specifications' publication.

PRESET ADJUSTMENTS

NOTE: Some of the preset adjustments on this chassis range are very critical, not only from an operational and performance point but — in certain cases — also from a safety aspect. In particular, the setting of 'HT SET' preset VR1 on the switched mode power supply — is a 'safety critical' setting and should normally NOT be disturbed from the factory preset adjustment.

PLEASE NOTE: We, the manufacturers, recommend that you read and understand fully the section on 'PRESET ADJUSTMENT' — BEFORE making ANY adjustments to the internal presets.

GENERAL SERVICE - MECHANICAL DETAIL

This section provides information on the removal and replacement of major service items such as: CRT, Diode Split Transformers, PCB assemblies etc.

CIRCUIT DIAGRAMS - CIRCUIT DESCRIPTIONS - PARTS LISTING

Circuit diagrams and circuit details are contained in the relevant individual sections in this Manual.

These circuit descriptions are supplemented, where required, with additional diagrams, Printed Circuit Board layout illustrations, Parts Listings etc. — all relevant to the particular PCB assembly described.

Interface connections between the various PCBs forming the complete assemblies are provided in the 'Interconnection Diagrams' and are included as a further aid to servicing.

ILLUSTRATED PARTS LISTING

This section contains current cabinet designs in the Microvitec range.

It is intended to show the service technician how to gain access to the equipment for repair or adjustment purposes.

In addition, component part numbers accompany each illustration. This will assist when the need to order a component part arises.

MODEL SUPPLEMENTS

From time to time new or different models may be introduced into the range, or special, or modified versions of existing models may be supplied.

To cover these service requirements MODEL SUPPLEMENTS may be issued as occasion demands.

These 'supplements' — when supplied — are normally located at the back of this Manual.

SAFETY STANDARDS

SAFETY AND ISOLATION

UNDER NO CIRCUMSTANCES SHOULD ANY FORM OF REPAIR OR MAINTENANCE BE ATTEMPTED BY ANY PERSON OTHER THAN A QUALIFIED ENGINEER.

Most of the circuitry on the chassis assembly is isolated from the mains by T2, R3, C7, C8, C9, 6.5mm airgaps and double insulation. To maintain this safety factor ensure that, after repair, air gaps and leakage paths are not reduced by protruding wires etc., which may exist after component replacement.

NOTE: SWITCHED MODE POWER SUPPLY UNIT (S.M.P.S.U)

Although the outputs from the power supply are isolated from the incoming mains supply, the bridge rectifier and the control and regulation circuit ARE NOT isolated. Therefore, when servicing the power supply section of the panel, the chassis should be supplied by a MAINS ISOLATION TRANSFORMER OF AT LEAST 200W RATING.

The power supply section remains charged with respect to chassis for 30-60 seconds after switching off. Care should be taken when handling the chassis to avoid touching this area during this time.

Components marked ⚠ on the parts list and circuit diagram are safety approved types and should be replaced only with components supplied or approved by our Service Department. It is also recommended that the components not marked with the safety symbol should be replaced by parts of the type originally fitted, and this applies particularly to those resistors which are stood off the printed wiring boards.

HANDLING PRECAUTIONS - STATIC ELECTRICAL CHARGES

Depending on equipment type and model, the equipment may contain devices which may be damaged by static electrical charges during handling. Generally, these devices are indicated by a symbol.

When replacing or handling these devices or PCBs containing such devices, care should be taken. Soldering irons should be earthed and personnel should use wrist straps earthed via a 1M ohm resistor. If the latter is not practicable they should discharge themselves of any static electricity by touching an earthed point.

Static sensitive devices should be packed in suitable conductive containers.

NOTE: Electrostatic discharge does not necessarily 'kill' a component completely — more likely it will 'wound' it.

Many static wounded devices will pass normal test both on site and in Service Workshops. In this respect, PCBs containing such 'wounded' devices are a major cause of 'no fault found' problems.

It pays, therefore, to cultivate static safe ways when dealing with such static sensitive equipment!

SAFETY CHECKS

Microvitec recommend that after effecting any repair and/or replacement of any part of the monitor you should carry out the following safety checks:-

1. Earth Continuity Check

a) Using a suitable multimeter check between dag earth on CRT and mains plug earth pin, the reading should be less than 100kohm (with tube discharged).

b) Check mains earth continuity between plug earth pin and:-

(1) CRT 'P' band.

(2) PCB earth pin (CHASSIS GND).

c) The case should then be finally assembled and earth continuity checked between the mains plug earth pin ⏚ and all exposed bare metalwork.

NOTE: Test b) and c) should have a resistance less than 0.5 ohm.

2. High Voltage Isolation/Insulation Checks

a) On the mains plug, check between LIVE and NEUTRAL to ⏚ EARTH for leakage and breakdown.

The test should be between 1.5 and 1.6kV AC or DC equivalent.

(1) No breakdown should occur.

(2) Earth leakage should be less than 0.75mA AC.

CAUTION: A MONITOR FAILING ANY OF THE ABOVE CHECKS MUST BE RESTORED TO SAFE WORKING CONDITION BEFORE BEING RETURNED TO THE USER.

TECHNICAL SPECIFICATIONS — SERIES-4

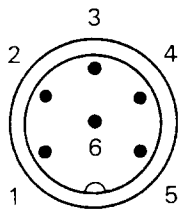
MODELS	:	1431/DS4F - Standard Resolution 1431/MS4F - Standard Resolution
SYSTEM	:	1) 625 lines, 50 fields interlaced or 312/313 lines, 50 fields non-interlaced. 2) 525 lines, 60 fields interlaced or 262/263 lines, 60 fields non-interlaced. Other non-standard systems may be suitable: consult MICROVITEC PLC.
SUPPLY	:	Nominal 180-265V, 40 to 60Hz
TIMEBASE (LINE)	:	Pull-in range 15 to 16kHz
FRAME FREQUENCY	:	50Hz or 60Hz (Automatic height switching)
POSITIONAL ERROR	:	±3%
CONVERGENCE ERROR	:	0.6mm screen centre 1.6mm screen edge
EHT	:	25kV approximately
EHT REGULATION	:	±1kV
LINE FREQUENCY	:	15.625/15.75kHz
DEGAUSSING	:	Automatic at 'switch on'
BANDWIDTH	:	18MHz
RESOLUTION	:	452(H) x 585(V) elements
'DOT' PITCH	:	0.64mm phosphor trio pitch - vertical stripe.
CRT	:	Rectangular : 335.4mm (screen diagonal) 90° deflection. Precision in-line gun, vertical stripe screen. High voltage focus.
INPUTS	:	TTL compatible, RGB inputs. (wired-in link selectable, 4V Linear inputs). Positive video. Mixed or separate line and field synchronisation:- Option a) Mixed negative syncs. Option b) Separate positive syncs.
POWER CONSUMPTION	:	65 watts approximately.

INPUT CONNECTIONS AND CUSTOMER CONTROLS — SERIES-4

1. MODELS : 1431/DS4F
1431/MS4F

2. SIGNAL INPUTS : RGB (TTL level) for all monitors listed above.

3. SIGNAL INPUT CONNECTIONS : Input socket : 6-pin DIN
240° — Type 45322



INPUT SOCKET

Pin No.	Connections
1	RED
2	GREEN
3	BLUE
4	SYNC A
5	GROUND
6	SYNC B

4. CUSTOMER CONTROLS : a) MAINS SWITCH/NEON INDICATOR

b) CONTRAST CONTROL

Note:

MOUNTING POSITION OF CONTROLS VARIES ACCORDING TO CABINET STYLE.

NOTE: Pin out connections are shown viewed from the front of the socket and rear (solder-side) of the connector plug.

TECHNICAL SPECIFICATIONS — SERIES-5

MODEL	:	12H529NS3 - High Resolution
SYSTEM	:	1) 625 lines, 50 fields interlaced or 312/313 lines, 50 fields non-interlaced. 2) 525 lines, 60 fields interlaced or 262/263 lines, 60 fields non-interlaced. Other non-standard systems may be suitable: consult MICROVITEC PLC.
SUPPLY	:	Nominal 180-265V, 40 to 60Hz ~
TIMEBASE (LINE)	:	Pull-in range 15 to 16kHz
FRAME FREQUENCY	:	50Hz or 60Hz (Automatic height switching)
POSITIONAL ERROR	:	±3%
CONVERGENCE ERROR	:	0.6mm screen centre 0.9mm screen edge
EHT	:	22kV approximately
EHT REGULATION	:	±1kV
LINE FREQUENCY	:	15.625/15.75kHz
DEGAUSSING	:	Automatic at 'switch on'
BANDWIDTH	:	18MHz
RESOLUTION	:	720(H) x 540(V) elements
'DOT' PITCH	:	0.31mm phosphor trio pitch.
CRT	:	Rectangular : 292mm (screen diagonal) 90° deflection. Precision in-line gun. High voltage focus.
INPUTS	:	6 x BNC sockets — 1 VOLT/75R : Sync.-on-green. RS170 RGB, with loop-through facility. Terminated/unterminated switch facility. Each BNC - input operates in differential mode and is not affected by common-mode noise on any input up to 5V p-p, (relative to chassis ground).
POWER CONSUMPTION	:	60 watts approximately.
CUSTOMER CONTROLS	:	a) Mains switch/Neon indicator b) Contrast control c) Brightness control d) Selector switch - 75R/Hi-Z input

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PRESET CONTROL ADJUSTMENT

GENERAL

Preset controls are initially set up at the factory and normally do not require adjustment unless a change is required in the input configuration — for example, typically to install a different graphics adaptor card in the associated host system. Details of the preset controls with their use and adjustment is described following:

PRESET ADJUSTMENTS

TO PROTECT AGAINST ELECTRICAL SHOCK HAZARD AND TO PROTECT THE MONITOR AGAINST SHORT CIRCUIT AND DAMAGE — USE ONLY AN INSULATED NON-METALLIC TRIMMING TOOL TO MAKE ADJUSTMENTS TO THE PRESET CONTROLS.

Care should be taken when adjusting presets. Adjust only one at a time and note carefully the effects of the adjustment before proceeding on to other adjustments. In some cases, it may be advisable to take note of the original setting position of the preset BEFORE adjustment in case the need arises to return to the original setting.

INTERCONNECTION COMPATIBILITY

On installation and prior to preset adjustments, ensure that video and sync connections from the host system are compatible with:

a) The monitor.

b) The interconnecting lead assembly in use.

Having determined these points are correct, proceed with the adjustments required according to the details given in the accompanying table and descriptions following.

PRESET CONTROL SETTINGS

1. To set the preset controls, use a signal generating a display occupying as large a screen area as possible. For example a full page of upper case letter 'H' would be suitable, or alternatively a suitable test card as appropriate.

2. Preset controls in the table following marked with an asterisk * may be adjusted if required.

   However, normally this should not be necessary, as these presets are set accurately at the factory during manufacture.

   NOTE: A circle is employed in the screen displays illustrated following, only to demonstrate more clearly the geometric effects of wrong settings.

PRESET LOCATIONS

The physical locations of the preset controls referred to in the descriptions following are shown in the illustrations contained in this Section.

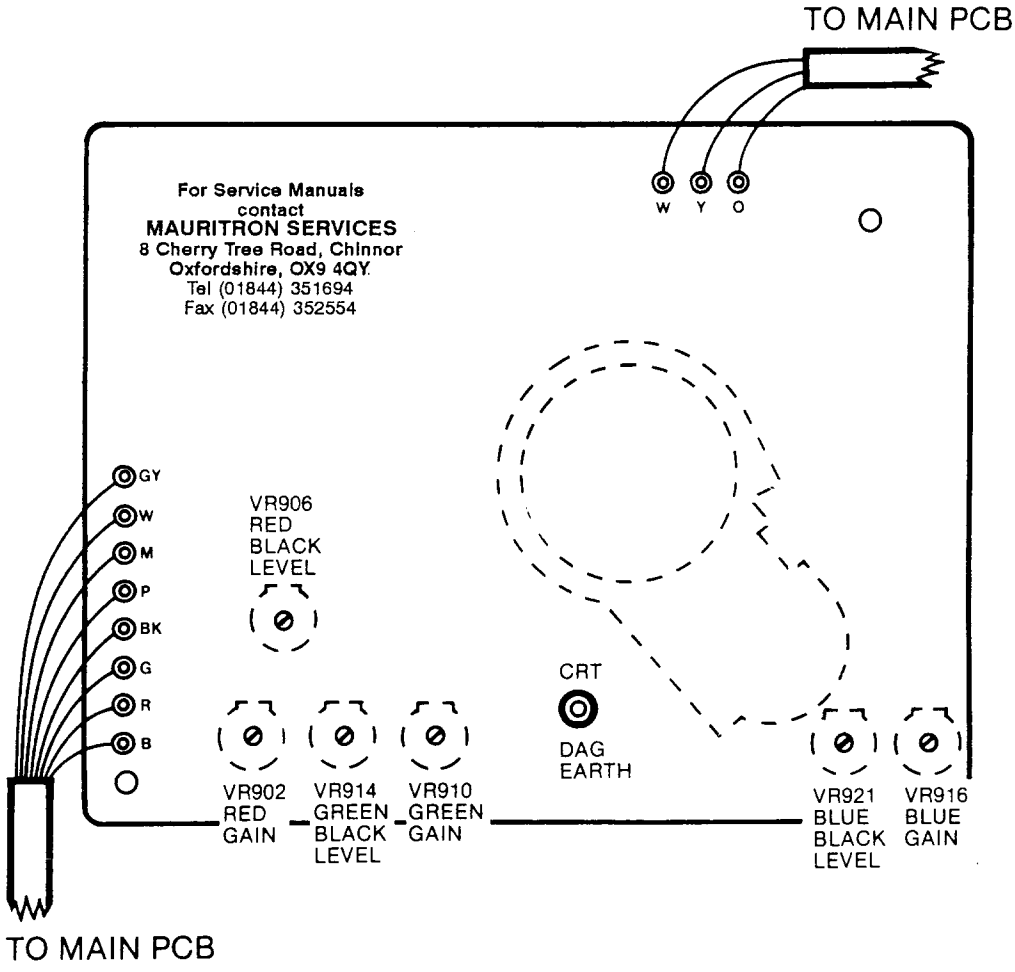
Noteable exceptions are:- 'SET HT' preset on the SMPSU (which should NOT normally be re-adjusted) and, the 'R, G, B GAIN' presets on the ANALOGUE only interface.

The positions of these presets are indicated on the individual PCB's by appropriate ident markings.

PICTURE TUBE - COLOUR CONVERGENCE/DEFLECTION ASSEMBLY SETTINGS

IMPORTANT NOTE: The deflection/coil assembly and colour convergence magnet assembly are an Integral part of the colour picture tube. These components are very precisely adjusted and set at the time of the tube's manufacture.

Under no circumstances should these components be removed from the tube or their settings be disturbed or seals broken, as otherwise - the tube's warranty will be rendered void.



TUBE - BASE PCB - PRESET CONTROLS - SERIES-4 AND SERIES-5
(VIEWED FROM 'TRACK-SIDE' OF PCB)

FACTORY PRESET ADJUSTMENTS

NOTE: Adjustments of picture display presets are described following.

Adjustments are best made using a static display/test card, or similar.

Graphic representation of correct and incorrect settings of some of the presets most likely to be used are shown in the accompanying Table of Preset Adjustments.

1. SET HT VR1

Located on the Switched-Mode Power Supply.

IMPORTANT: This is adjusted accurately at the factory, to give +110V (Series-5) or +115V (Series-4) -with a dark picture on screen and SHOULD NOT be re-adjusted.

WARNING: THIS IS A CRITICAL SAFETY ADJUSTMENT. FAILURE TO COMPLY WITH THE ABOVE WILL INVALIDATE THE WARRANTY.

2. LINE FREQUENCY, VR201 (Horizontal Hold)

a) To adjust VR201; feed the monitor with RGB video information and interrupt the mixed sync information to the line oscillator by removing the sync information on input connection PL101, (Series-4) or the input socket (Series-4/5).

b) Adjust VR201 until picture almost stabilizes, then reconnect sync - this should result in a stable picture lock.

3. FIELD FREQUENCY, VR301 (Vertical Hold)

Control of free running field oscillator frequency is achieved by VR301 being adjusted to give a stable picture lock.

This may be achieved by using either of the alternative methods described following:-

3.1 Using a Digital Frequency Meter (DFM)

a) Attach the test probe to either Pin 8 of IC301, or to the 'live-end' of the field-scan coils (Pin 4, PL201).

b) With no input signal applied to the monitor - adjust preset VR301 until the free-running field oscillator frequency registers 46Hz ±1Hz. This completes the adjustment.

3.2 Adjustment without DFM and with 50Hz/ 60Hz Pattern Generator/Microcomputer

50Hz PATTERN GENERATED

a) Display a 50Hz graticule, cross-hatch pattern, test card or similar.

b) Rotate preset VR301 fully anti-clockwise:-

Then turn VR301, SLOWLY clockwise until the picture display locks.

Continue turning slowly, noticing that the picture height decreases to a point where the picture abruptly expands to a setting of MAXIMUM height.

Stop turning at this point.

NOTE: 'Rocking' the setting of the preset very slightly may help in determining the maximum setting.

c) Attach approximately 75mm (3") of masking tape or similar temporarily to the top centre of the tube face, running the tape vertically downward. On this tape, mark the position of the topmost horizontal line of the display pattern - this marks the MAXIMUM height setting.

NOTE: This horizontal line on the display becomes the reference point for ALL setting/markings of VR301 referred to following.

d) Turn VR301, now anti-clockwise slowly, to a point where the display height abruptly collapses. 'Rock' the preset gently to determine the MINIMUM height setting. Again, mark the position of the horizontal reference line, to mark the minimum reference point on the tape.

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e) Measure carefully the 'mid-point' between the maximum and minimum markings and mark this central MID-POINT reference on the tape.

f) Adjust preset VR301 slowly anti-clockwise until the 'horizontal line reference' on the display matches the central mid-point reference marked on the tape - as in e) above.

60Hz PATTERN GENERATED

Repeat operations a) through to e) but with 60Hz pattern displayed.

With NEW minimum, maximum and mid-point markings on the tape (coinciding with the 60Hz 'horizontal reference line'), align VR301 by turning slowly clockwise. Continue to rotate slowly clockwise to a point where the display increases abruptly in height. Rotate the preset further, until the 'first horizontal reference line' on the display starts to lower, and rotating further - adjust the horizontal reference line to align with the mid-point marking on the tape.

Adjustment is now complete.

Remove tape from CRT. Removal of sync will allow the display to lose picture lock. Restoring sync should lock the display.

4. LINE PHASE VR202 (Horizontal Phase)

a) VR202 controls positioning of video information relative to the raster in a line-scan direction.

b) Ensure the following operations have been effected:

1) The line frequency has been set (VR201)

2) The picture width has been set (VR401)

3) If possible, the monitor is positioned in its place of use.

NOTE: VR202, when adjusted, will shift the picture right or left.

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5. WIDTH, VR401 *

CAUTION: CARE SHOULD BE TAKEN WHEN ADJUSTING THIS COMPONENT DUE TO ITS PROXIMITY TO EHT SECTION, IN PARTICULAR THE AREA OF THE DIODE-SPLIT TRANSFORMER AND CIRCUITRY.

Using a non-metallic trimming tool adjust VR401 to effect picture width adjustment.

6. EAST-WEST CORRECTION, VR402 *

NOTE: Some models will not require this adjustment because 'East-West Correction' is integral with certain types of CRT.

Correct adjustment of VR402 (when fitted) will achieve straight verticals on left and right hand sides of pictures.

* NOTE: Preset Controls - 'Width', VR401 and 'East-West Correction', VR402 are interactive. It is important that 'Width' and 'East-West' controls are set in conjunction to obtain correct results.

7. HEIGHT, VR302

VR302, when adjusted, will provide for raster under scan and over scan.

8. FIELD LINEARITY, VR303 (Vertical Linearity)

Adjust VR303 to give a linear picture in a vertical direction.

NOTE: Best results are obtained by using a cross-hatch type grid or static test pattern.

9. FIELD SHIFT, PL301/VR304 (Vertical Shift)

On the 'Series-4 main chassis' PCB assembly, the position of 'Moveable Link - PL301', determines positioning of the raster in a vertical scan direction. This link may be fitted in one of two positions on PL301 depending on Tube characteristics, or not fitted at all. On the 'Series-5 main-drive board' PCB assembly, preset VR304, 'Field Shift' determines the positioning of the raster in a vertical scan direction.

10. FOCUS

Focus is located on the end of the diode-split transformer (T202)

- To adjust - Set 'CONTRAST' control to max, then make focus adjustments to obtain a 'sharp', clear image over the whole picture area.

11. COLOUR GAIN CONTROLS AND COLOUR BACKGROUND (BLACK LEVEL) CONTROLS

MAKE THE FOLLOWING ADJUSTMENTS USING A DC COUPLED OSCILLOSCOPE

a) To adjust colour gain controls:-

(1) Reduce beam current to minimum by turning A1 'Screen' preset fully anti-clockwise.

(2) Provide a test pattern with peak white and black level information.

(3) Ensure Customer Contrast Control is fully clockwise to provide maximum drive voltages to video output stages.

b) To adjust Red, Green and Blue gain controls:-

(1) Adjust VR902 for *Red peak-to-peak drive volts at R926, CRT - red cathode feed resistor.

(2) Adjust VR910 for *Green peak-to-peak volts at R925, CRT - Green cathode feed resistor.

(3) Adjust VR916 for *Blue peak-to-peak volts at R924, CRT - Blue cathode feed resistor.

(4) The above voltages should measure typically as follows:-

a)	* 70V p-p on 14" monitor - TTL mode - Standard Resolution
b)	* 60V p-p on 14" monitor - Medium Resolution

c) To adjust colour background controls (black level settings):-

Adjust Red, Green and Blue presets on the Tube Base panel as follows:-

(1) Adjust VR906 for Red cathode (black level) volts.

(2) Adjust VR914 for Green cathode (black level) volts.

(3) Adjust VR921 for Blue cathode (black level) volts.

(4) The voltages for the above levels should be as follows:-

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150V black level, for Standard Resolution 14" Monitor (TTL or Linear)
140V black level, for Medium Resolution 14" Monitor (TTL or Linear)

d) Disconnect the Input Signal (RGB sync)

(1) Adjust A1 'Screen' until a raster is just visible.

(2) Raster colour may be neutral. However it is very likely shaded towards red, green, blue or a combination of any two colours.

(3) Establish raster colour shading as follows:-

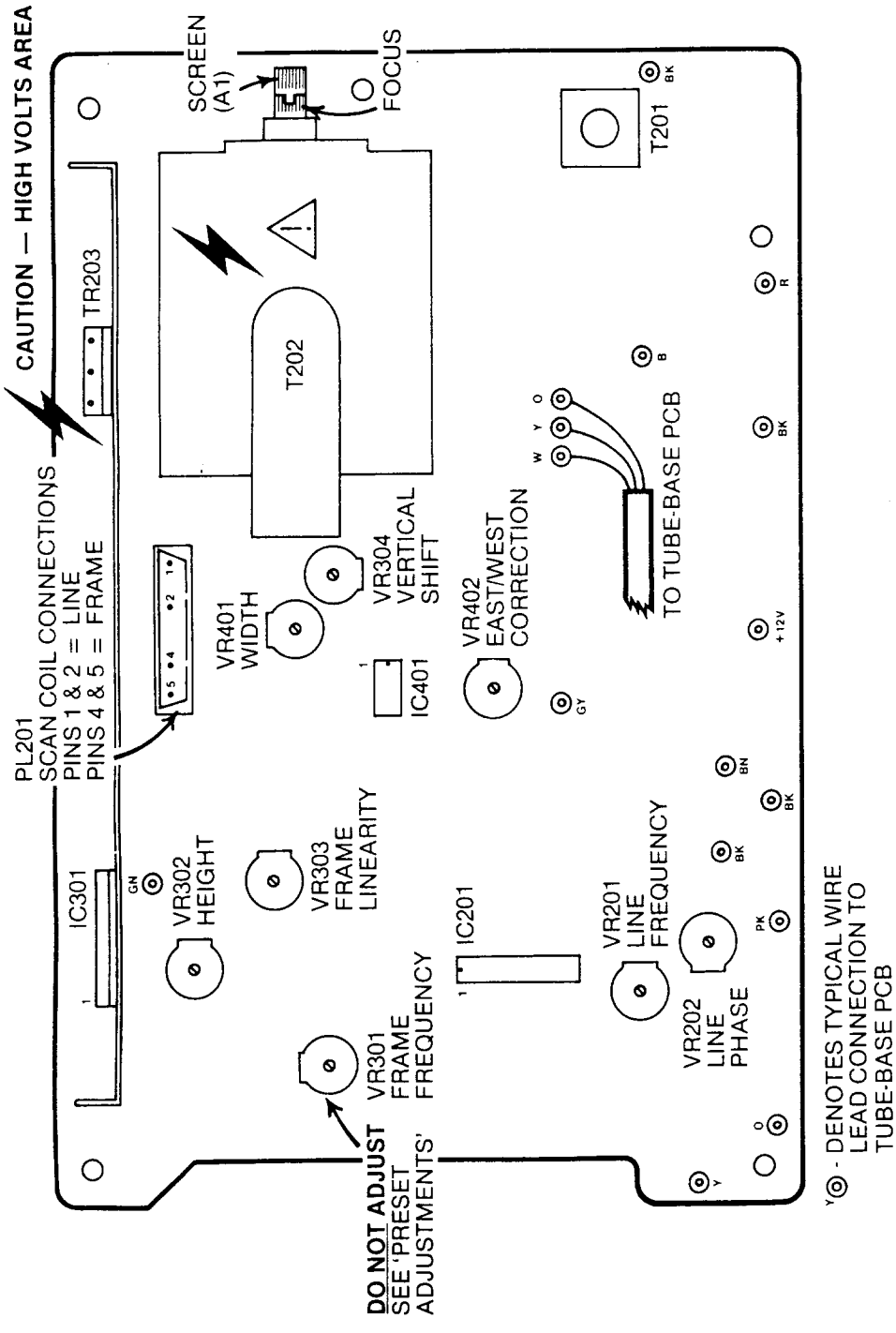
a)	Red and green	-	Yellow
b)	Red and blue	-	Magenta
c)	Blue and green	-	Cyan

(4) Reduce black level of remaining one or two guns using VR906, VR914, VR921 or combination until a neutral raster is achieved.

(5) Re-adjust A1 'Screen' to just extinguish raster.

(6) Input - R, G, B and sync signals (full white screen) then adjust the Customer Contrast Control throughout its full travel.

(7) If correct greyscale has not been achieved, repeat operations d) (1) through to (6).



SERIES-5 DRIVE/DEFLECTION BOARD PCB - PRESET CONTROLS

WARNING: If making adjustments to the preset controls located on this board through the metal cabinet base - an insulated trimming tool must be used to prevent shorts.

NOTE: Do not adjust presets VR1 'SET HT' and VR301 'Frame Frequency', BEFORE reading 'Preset Adjustment' instructions.

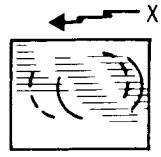
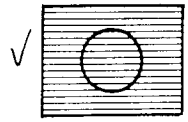
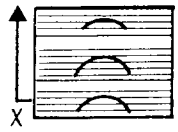
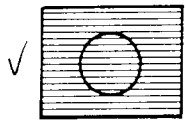
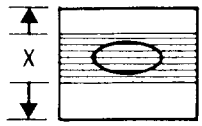
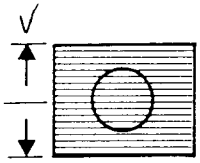
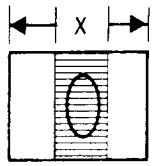
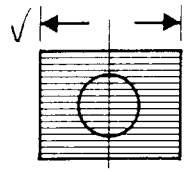
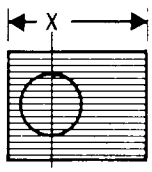
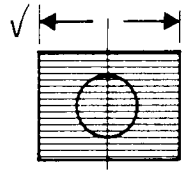
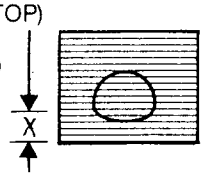
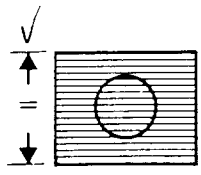
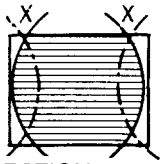
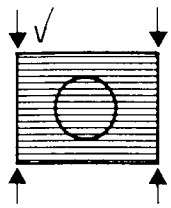
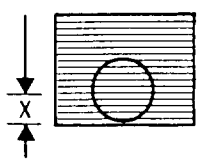
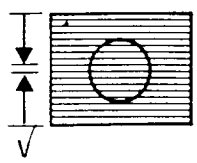
PRESET	WRONG X	RIGHT √
LINE FREQUENCY	PICTURE BREAKS UP ADJUST L.FREQ. 	 PICTURE LOCKED
FIELD FREQUENCY	PICTURE ROLLS ADJUST F.FREQ. 	 PICTURE LOCKED
HEIGHT	ADJUST HEIGHT 	 HEIGHT SET
WIDTH	ADJUST WIDTH 	 WIDTH SET
LINE PHASE*	PICTURE NOT CENTRAL ADJUST L. PHASE 	 PICTURE CENTRAL PHASE SET
FIELD LINEARITY* (VERTICAL LINEARITY)	BOTTOM (OR TOP) OF PICTURE COMPRESSED ADJUST F.LIN 	 VERTICAL SCAN LINEAR LIN.SET
EAST/WEST* CORRECTION	PICTURE 'BARREL SHAPED' OR 'PIN-CUSHION' SHAPED — ADJUST E/W CORRECTION 	 VERTICAL EDGES STRAIGHT E/W SET
FIELD SHIFT	PICTURE NOT CENTRAL ADJUST FIELD SHIFT 	 PICTURE CENTRAL FIELD SHIFT SET

TABLE OF PRESET ADJUSTMENTS

REMOVAL/INSTALLATION OF MAJOR ITEMS

WARNING: ENSURE THE MONITOR IS DISCONNECTED FROM THE MAINS ELECTRICAL SUPPLY BEFORE EFFECTING ANY OF THE FOLLOWING OPERATIONS.

DANGER!

NOTE: The tube stays charged to the full working voltage of 22kV:

DISCHARGE THE TUBE BEFORE ATTEMPTING TO REMOVE THE EHT CAP (POPPY).

OBSERVE THE WARNING TO DELAY HANDLING THE CHASSIS FOR 30-60 SECONDS AFTER SWITCH OFF.

1. MAIN CHASSIS REMOVAL

Having gained access by removing the appropriate cabinet sections (see section on MECHANICAL PARTS LISTING and illustrations for particular cabinet detail involved), proceed as follows:

a) Discharge the tube final anode to CRT dag coating, preferably using EHT probe or bleed resistor.

Disconnect the EHT lead from the CRT final anode connection.

To ensure no charge remains, connect the EHT lead to chassis metalwork.

b) Completely discharge the CRT final anode by connecting to CRT dag coating/earthing braid.

c) Unplug connectors PL1 and, on some cabinet versions, PL2 (if fitted), and mains connector PL3 and PL201 scan coil connector.

d) Remove tube base panel from CRT.

Unplug CRT earth braid lead from dag earth braid pin on tube base panel marked 'CRT'.

e) If fitted:-

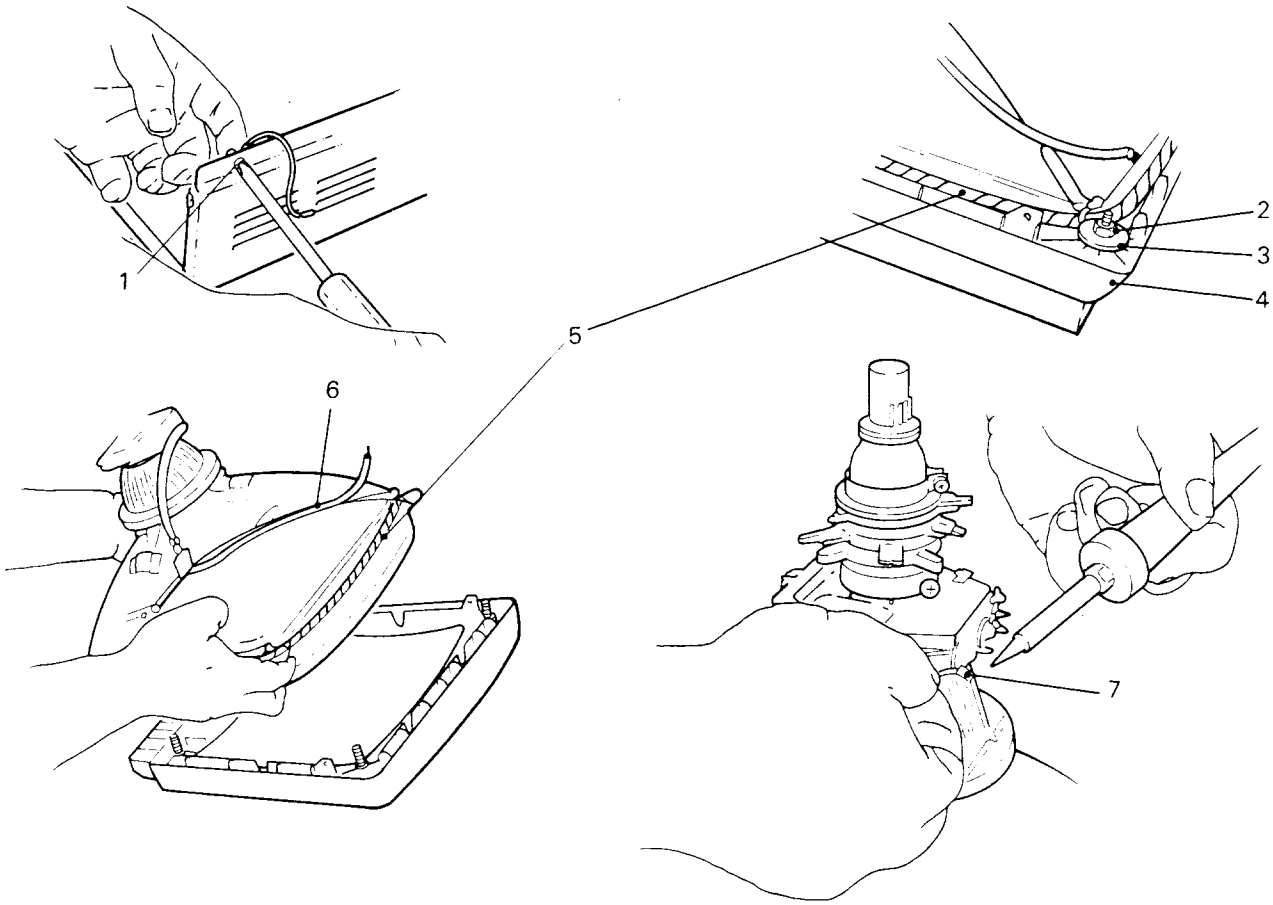
Unplug the 'P' band earthing lead from the main chassis PCB earthing pin marked 'Chassis Gnd' —adjacent to the diode-split transformer.

f) Release in turn each of the nylon self-locking PCB support clips, lifting the PCB slightly in each case.

g) Unplug connectors to PL101 and PL102 (if fitted).

h) The main chassis PCB may now be removed by lifting upwards and withdrawing from the rear.

FOR INSTALLATION, THE OPERATIONS LISTED ABOVE SHOULD BE CARRIED OUT IN REVERSE ORDER.



CRT Removal/Installation

2. CRT REMOVAL/INSTALLATION

a) Effect operations 1a through to 1h, then position monitor so that the CRT is face down on two padded support blocks.

b) On 'M' and 'N' Series cabinets, remove earthing leads and earthing screw (1).

On 'D' Series cabinets refer to illustrated parts list for mechanical details.

Refer to the illustrated mechanical parts section and remove base of the monitor.

c) Remove the four nuts (2) and large washers (3) securing CRT to cabinet fascia (4).

d) Carefully withdraw CRT vertically.

e) Transfer degauss coil (5) and earthing braid (6) and scan coil lead assembly (7) to new CRT.

IMPORTANT: Do not disturb the tube neck components. These have been set for optimum performance during manufacture and are an integral part of the tube system.

f) Install main PCB assembly by effecting operations 1a through to 1h in reverse order.

g) CRT installation safety checks:

(1) Check for correct fitting of CRT earthing braid (6)

(2) Ensure black lead from CRT earth braid to tube base panel is connected.

(3) Check 'P' band earth pin has been connected to main PCB.

3. LINE OUTPUT TRANSISTOR TR203: REMOVAL/REPLACEMENT

Removal:

a) Remove the wire 'hair-pin' clip retaining TR203 to the heatsink assembly - take careful note of the fitting method employed.

NOTE that TR203 should be fully isolated from the metal heatsink assembly.

b) Unsolder base, emitter and collector connections from the main PCB and withdraw the transistor vertically.

Replacement

c) Re-assemble in reverse order. Ensure correct fitting of insulating and thermal conducting pad.

4. EHT DIODE SPLIT TRANSFORMER T202

Removal:

a) Discharge the final anode of the CRT to the earth braid.

b) Disconnect the EHT lead connector from the CRT.

c) Remove the focus/(A1) screen leads from the tube base panel assembly.

To disconnect the focus lead entering the tube base, it will first be necessary to prise off the insulating cap - take care not to damage the cap or base.

d) Unsolder connections on tube base panel and main chassis PCB, and withdraw T202 diode split transformer from main PCB.

Replacement:

Replace in reverse order.

a) When replacing T202 - ensure all soldered connections are smooth and that all connections are kept short in order to guarantee adequate voltage clearances.

b) Finally — when replacement is complete -

reconnect the CRT, EHT connector.

check and switch on.

then re-adjust the 'FOCUS' and (A1) 'SCREEN' controls for optimum settings.

(see Section on 'FACTORY PRESET ADJUSTMENTS').

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SWITCHED MODE POWER SUPPLY

CIRCUIT DESCRIPTION - GENERAL

The switch mode power supply is a fully isolated system.

This operates, under normal conditions, at a free-running frequency of between 40 and 60kHz.

Integrated circuit IC1 (TDA4600) provides for control of all circuit functions within the power supply.

OUTPUT CIRCUITRY

The rectified mains voltage, developed across reservoir capacitor C6, is switched to the primary winding of T2 by output transistor TR1. The output voltages provided of +12 volts and +115 volts* ('Set HT' measurement point) are generated initially at taps on the secondary winding of T2.

*NOTE: On Series-5, +12 volts = 13 volts and +115 volts = 110 volts.

These voltages are then rectified and smoothed by D9, D10, C18, C19 and R18 and C20 to provide the DC supply rails of +12V and +115V.

NOTE: With wire link LK8 installed, the unit is set for 110 volts AC mains input supply and capacitors C6a, b, c, and C6d, act as voltage doublers on this setting.

BASE DRIVE - TR1

The base drive for output transistor TR1 is generated within IC1.

The current at Pin 8 of IC1 controls the 'Switch-on' period, that at Pin 7 controlling the 'Turn-off' conditions of TR1.

A sawtooth voltage is developed at Pin 4 by R11, R19 and C13. This is used to generate a sawtooth base drive at Pin 8 to prevent over-saturation of output transistor TR1.

CONTROL/LOGIC CIRCUITRY

A voltage which is proportional to the output voltages is taken from the feed-back winding on T2 and is rectified and smoothed by D6 and C12. This voltage is attenuated by preset VR1 (Set HT), R10, R7 and R8 with respect to a reference voltage at Pin 1 of IC1 and is applied to Pin 3. Changes in the output are thus transmitted via Pin 3, to the control logic and base current amplifier within IC1.

In this manner, the frequency and duty cycle of the output pulses are then adjusted accordingly to correct for any changes.

Preset VR1 (Set HT), adjusts the proportion of voltage feed-back and hence the output at the 'SET HT' measurement point.

Resistor R9 completes the oscillator feedback loop and feeds an attenuated voltage from TR2's feed-back winding to Pin 2 of IC1. This allows IC1 to detect the point at which the output pulse crosses zero voltage level, and thus provide correctly timed base drive pulses to output transistor TR1.

The supply for IC1 is provided by a tapped winding on T2 and diode D7 and capacitor C15. A start-up supply for IC1 is obtained through R6.

OVERLOAD PROTECTION

If an overload occurs on either the +12V or +115V outputs, * the frequency and duty cycle are reduced - thus limiting the power supplied to the load.

*NOTE: On Series-5, +12 volts = 13 volts and +115 volts = 110 volts.

If the overload is developed further and becomes a short circuit, the frequency is further reduced to 1.4 kHz and, consequently, the power output is limited to a low level.

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LINE SCAN AND EHT

LINE SCAN

Line drive pulses are derived from IC201 and are fed to the base of TR202a, the first stage of the line driver darlington pair TR202a/b. This driver pair feeds the primary of the line output driver transformer T201.

The secondary of T201 is coupled to the base of the line output transistor and provides a controlled source of pulses to switch the line output transistor TR203.

Diode Modulator - Active Adjustments

Components C218, C219, diodes D203, D204 and C220 with L203, comprise a diode modulator circuit. This circuit allows 'active adjustment' of display geometry including width and East/West correction when driven from IC401.

IC401 incorporates a Class D (switching) driver for the diode modulator and an E/W correction parabola generator. The vertical sawtooth current is converted to a voltage ramp across R405/407 which is then 'shaped' by IC401 into a parabola. This is compared by IC401 with a horizontal ramp generated by the horizontal flyback pulse with VR401, D401 and C403.

The comparator output, consisting of a line frequency square wave whose mark-space ratio varies with the field frequency parabola, is buffered then integrated by L201 before being applied to the diode modulator D203/204. VR401 varies the mean level of the horizontal ramp, hence the width : VR402 varies the gain of the parabola amplifier hence the amount of East/West correction.

Line Scan Output

The line scan output circuitry is based upon the conventional energy recovery principle.

Line deflection coils and associated inductors are tuned during the flyback period by capacitor C218/219.

Line linearity control is provided by saturable inductor L203 with damping resistor R218, in conjunction with the S-correction provided by C221.

+ 25 Volts Supply

The +25 volts supply for the field time-base is provided by a secondary winding on the Line/EHT transformer T202, energy from which is scan rectified and filtered by diode D302 and capacitor C306.

Fusible resistor R313 provides additional filtering and protection against short circuits on the +25 volt supply.

CRT Heater Supply

A further winding on T202 provides a supply for the CRT heaters, a reference flyback pulse for the sync processor (IC201), and a switching pulse for IC401.

+200 Volts Supply

The +200 volts supply for the video amplifier stages is provided by a tapping on the primary winding of T202 which is rectified and filtered by D202 and C215. Fusible resistor R220 provides protection against short circuits on the 200V supply.

EHT

The 25kV (nominal) EHT supply for the CRT is produced within the Line/EHT transformer T202 using an overwinding split into 3 main sections. Each of the overwinds are connected in cascade by integral high voltage diodes.

The leakage inductance and distributed capacitance of the overwind are tuned to harmonics of the flyback frequency. This results in a much improved EHT regulation and reduced 'breathing effect'.

The 'breathing' performance of the display is further improved by the incorporation of a thick film resistive substrate network connected across the first section of the overwind and integral with transformer T202. This network forms a potential divider and is used to provide adjustable focus and A1 (screen) voltages for the CRT display.

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SYNC PROCESSOR - LINE & FIELD OSCILLATORS

GENERAL

The functions of synchronising, gating, line drive pulses and field oscillator ramp generation are achieved using the integrated circuit IC201 (TDA2578A).

Three outputs are derived - these are :-

1) A line drive pulse to switch the line driver darlington-pair of transistors (TR202a and TR202b).

2) Field oscillator ramp-voltage to drive the field output integrated circuit IC301.

3) A sandcastle pulse providing colour burst gating, clamping information and flyback blanking at both line and field rate.

   The latter facility is currently used only with display monitors requiring linear composite video signal inputs and incorporating suitable interface circuitry (reference SERIES-5 with Analogue Interface).

SYNC SEPARATOR

Transistor TR106, acting as a buffer, converts positive-going signals fed to its base into the negative-going source required by the video input on Pin 5 of IC201.

The sync separator section incorporates a noise inverter and a self-adjusting pulse slicing circuit, to produce in conjunction with IC201, a sync pulse train with constant amplitude over a wide range of input levels.

LINE OSCILLATOR - CONTROL & OUTPUT

In operation, the line oscillator utilises pulses taken from the sync separator and compares them with a phase-locked-loop oscillator running precisely at 15.625kHz.

The free running frequency of the line oscillator is determined by C211, R201 and preset VR201 which allows precise setting of line oscillator frequency.

Control Characteristics

The phase locked loop has a short time constant for rapid locking from "out-of-sync" conditions.

In 'in-sync' conditions, a coincidence detector (pin 8, IC201) switches the loop to a long time constant. This provides excellent 'noise' immunity.

The fly-wheel time constant is set by components on Pin 8 (Phase detection output) of IC201.

Output Control

A second control loop (Pin 14, IC201) includes a phase detector which compares the timing of the output of the 15.625kHz oscillator, with a fly-back reference pulse taken from a secondary winding on the line output/EHT transformer T202.

This is fed to Pin 12 (fly-back reference input of IC201). This loop corrects for phase errors due to storage time variations of the line output transistor T203.

Preset VR202 'Line Phase', provides vernier adjustment of the loop phase detector control stage for centering of displayed information on the raster.

Resulting line output pulses are fed, via an internal open collector output stage, from Pin 11 of IC201: these pulses are used in turn - to switch the line driver darlington-pair transistors, TR202a/TR202b.

FIELD OSCILLATOR

Pulses from the main sync separator are fed internally into the vertical sync separator whose slice-level is controlled at Pin 4 of IC201.

The output pulses of the vertical sync separator are used to trigger a vertical oscillator/sawtooth generator (ramp generator).

This is connected internally to a comparator within IC201 and whose other input is connected to Pin 2 of this IC.

Negative feed-back from the field output stage (IC301) via an amplitude divider - is fed back to Pin 2 of IC201.

The output of this comparator drives an internal buffer amplifier, before being fed to Pin 1 (Field drive output) of IC201.

This is used in turn to drive the field output integrated circuit, IC301.

The oscillator ramp signal at Pin 3 of IC201, is controlled in frequency by VR301 (Frame frequency), C301 and R301.

Dual Standard Corrections

A circuit which detects 50/60Hz field standards and, as necessary, corrects automatically the display's height, is contained in IC201.

Flyback (retrace) Blanking

Transistor TR201 acts as an inverting switch (with speed-up diode D201) fed from the super-sandcastle pulse, pin 17 of IC201. This positive-going pulse contains line/frame blanking and burst gate information. Only the line and frame blanking portion of the pulse is used to switch TR201.

The negative-going blanking pulses at TR201's collector are applied - via resistors R225, 923 to TR907, which switches off the video output stages during both horizontal and vertical retrace.

Width Stabilisation and Beam Limiting

To correct for variation in picture width with brightness (breathing due to EHT voltage variation), the beam-current is fed from the low voltage end of the EHT transformer (T202) 3-section EHT winding, to a non-linear network comprising R120, 121 and D111.

This provides a correcting voltage to the base of pnp buffer TR107 which closely matches the non-linear variation of picture width with beam current. This voltage at the collector of TR107, is converted by current buffer (common base stage) R131 and TR105 to a correction current - fed directly to the inverting input, pin 7, of IC401, (the switching, East-West/Width control IC).

This correcting voltage, available at the collector of TR107, is also used for performing the beam-limit function.

R134 normally holds D113 conducting; setting the Contrast pots track at 5.6V; diode D112 is then made non-conducting.

When the beam current exceeds a preset maximum (nominally 700uA), the voltage at TR107's collector drops below 5 volts, diode D112 begins to conduct, pulling D113 out of conduction and allowing TR107 to control the voltage on the Contrast pots track.

As beam current tries to increase further, TR107's collector voltage drops further, reducing the Contrast pots track voltage - hence reducing the contrast, or mean beam current.

Components R132, C103, R112, C101 act as a 'low-pass' filter averaging the beam current, and therefore allowing the short term beam current (brightness), to exceed the above limit in order not to 'flatten' picture highlights.

The beam-current limiting preserves the life of the CRT, and prevents X-rays being radiated above the approved safety limits.

FIELD SCAN

GENERAL

The generation of power for field-scan operation is provided by IC301 and associated circuitry.

This integrated circuit incorporates a power amplifier and fly-back generator and is powered from the +25 volt supply derived from the line scan output stage.

CIRCUIT DETAIL

Field-drive is obtained from pin 1 of IC201 as a signal source. This signal is fed to input pins 1 and 3 of IC301. The resulting scan output current is taken from pin 5 of IC301 and is fed to the field deflection coils.

Current in the coils is sampled by resistor R308 and the voltage developed is fed back via VR302 (height), R307 and R305 to pin 2 of IC201.

This is compared within IC201 with a signal derived from the field rate ramp on pin 3 and the resulting error signal is developed on pin 1 of this same IC.

The gain of the amplifier within IC301 is controlled by VR302 (height) R307 and R308.

HF stability is maintained by C302.

Frame linearity is controlled by VR303 and C309.

A short flyback time is achieved by the use of a separate flyback generator incorporated with IC301.

The main HT supply to the field power amplifier during scan is applied to pin 6 via diode D301.

During flyback the voltage is transferred through C305 to pin 8, thus causing the voltage to double during flyback while diode D301 is not conducting.

This results in a more rapid collapse of the scan coil field until the voltage across the coils falls below 25 volts supply. Pin 8 of IC301 then swings back to a low voltage and the whole scan cycle is then repeated.

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CRT TUBE BASE PCB

GENERAL

The Tube-Base PCB Assembly employed in the 'Series-4' range of monitors, is also incorporated in the 'Series-5' monitor range.

This Tube-Base Assembly is housed on a separate PCB, and is connected to the 'Series-4' Main Chassis PCB Assembly, and to the 'Series-5' Drive/Deflection Board PCB Assembly by a permanently wired, flexible connecting harness.

The Tube-Base Assembly plugs directly on to the base of the CRT and in addition to the tube-base connecting socket and associate circuitry - houses also, the Red, Green, and Blue video output stages.

CIRCUIT DIAGRAM DETAILS

Circuit details for this assembly are provided in:-

a) 'Series-4' : Main Chassis and Tube Base Circuit Diagram.

b) 'Series-5' : Main Chassis Assembly and Tube Base Circuit Diagram.

These circuit diagrams may be referred to in conjunction with the descriptions following.

PCB LAYOUT

Details of the PCB layout for this assembly are provided under Section :- 'Circuit Diagrams/PCB Layout'.

This illustration 'CRT Base-Panel-Series-4/5', shows printed wiring track (viewed through the board), component identification and preset locations.

PRESET CONTROL ALIGNMENT

Alignment and setting-up instructions, for the preset controls on the tube-base PCB, may be found under section index: 'Preset Control Adjustments'.

CIRCUIT DESCRIPTIONS

The CRT Tube-Base socket employed with this PCB assembly incorporates integral 1-2 kV 'ring trap' spark-gaps for each electrode and has a separate 10kV spark-gap chamber for the high voltage focus electrode.

In addition, each electrode is further protected by a series resistor and, in some cases by a decoupling capacitor on G1 and A1 electrodes.

CRT cathodes are 'stood-off' from the video outputs by 220R series resistors, the Grid (G1) by a 100K resistor and the A1s by a 1K resistor.

The 'focus' electrode's potential of > 6.5 to 7.5kV, is provided by a thick-film substrate potentiometer located within T202, the diode-split transformer and is derived from a tap on the transformer's over-winding connecting to the 'FOCUS/A1' potentiometer chain.

The A1 (Screen) supply voltage, is provided by a similar type of series potentiometer in this chain, to supply a voltage adjustable within the range 200 to 800 volts.

The CRT's heater voltage is also derived from T202 and is fed via limit resistor R221.

CRT cathodes are driven directly from the video output stages mounted on the CRT Tube-Base Assembly.

This provides short-path connections, enhancing video bandwidth and improves stability and also minimises RF radiations.

TUBE-BASE PCB - VIDEO OUTPUT STAGES

Video output transistors TR902, 904, 906 act as inverting Class 'A' amplifiers at low video frequencies, with resistors R904, 912, 918 as the pull-up loads.

At higher video frequencies, the capacitance of the CRT cathodes becomes dominant, and D902, 904, 906 come out of conduction with TR902, 904, 906. This allows current to be diverted to the bases of TR901, 903, 905 - from R904, 912, 918, so forming active-loads to source current to the CRT cathodes.

The output stage therefore acts in Class 'B' at higher video frequencies, where a lower driving impedance is required to maintain a good video bandwidth into a capacitive load.

Diodes D901, 903, 905, bias TR901, 903, 905 close to conduction, to reduce cross-over distortion.

Inductors L924, 925, 926, in conjunction with the CRT cathode capacitances and CRT flashover current limiting resistors, R924, 925, 926, form 'low-pass-filters', which are optimised for a flat and extended video frequency response.

The voltage gain provided by the complete output stage is determined by the ratio of the 'feedback resistors' R935, 911, 917 to the input resistors, R902 & VR902, R908 & VR910, R915 & VR916, respectively. Hence the peak-to-peak video drive voltage levels at the cathodes can be varied by the 'video gain' presets VR902, VR910, VR916.

Capacitors C902 & 903, C904 & 905, C906 & 907 on the R, G and B stages provide 'Miller'-effect compensating capacitors.

The emitters of TR902, 904, 906 are held at 7.5 volts by D907 - during the raster scan periods, when TR907 is conducting. Their bases are connected to ground, by R905 & VR906, R913 & VR914, R920 & VR921 respectively.

By varying VR906, VR914 and VR921, the DC operating point (bias level) of the output stages can be set. This is used to set the R, G, and B cathode black-level 'cut off' points.

During flyback, TR907 is non-conducting, cutting off the emitter current to TR902, 904, 906 and forcing them out of conduction.

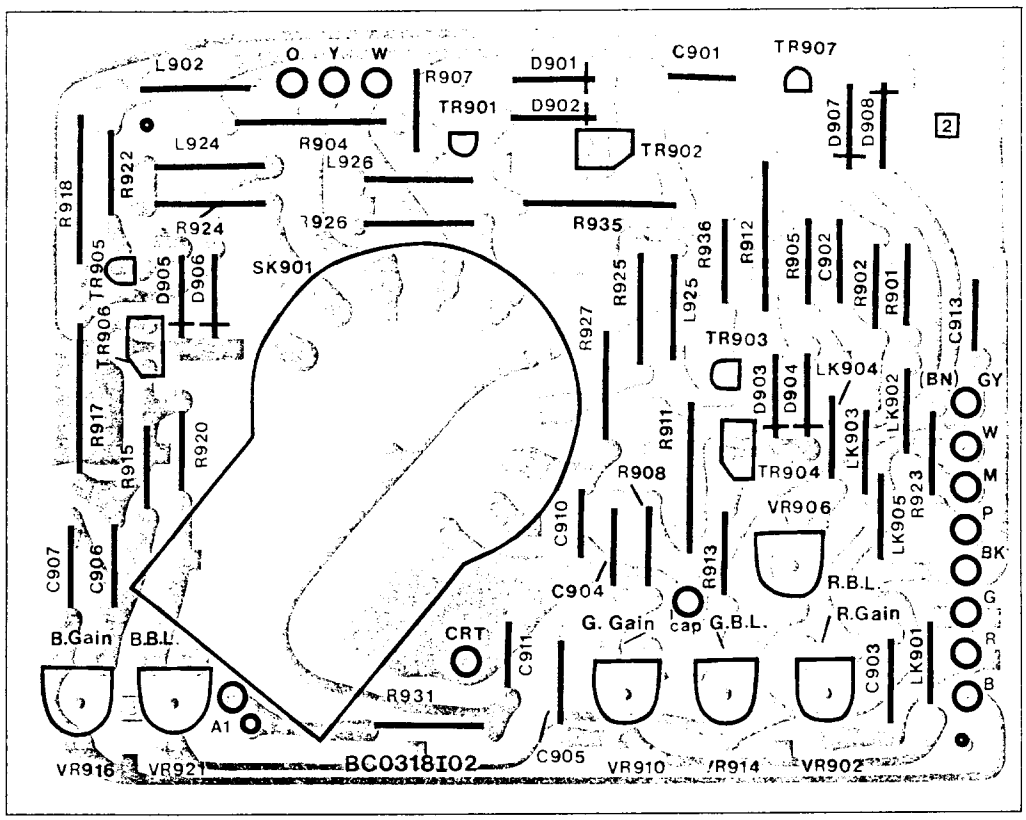
PRINTED CIRCUIT BOARDS - SERIES-4

This section illustrates the printed circuit boards comprising:-

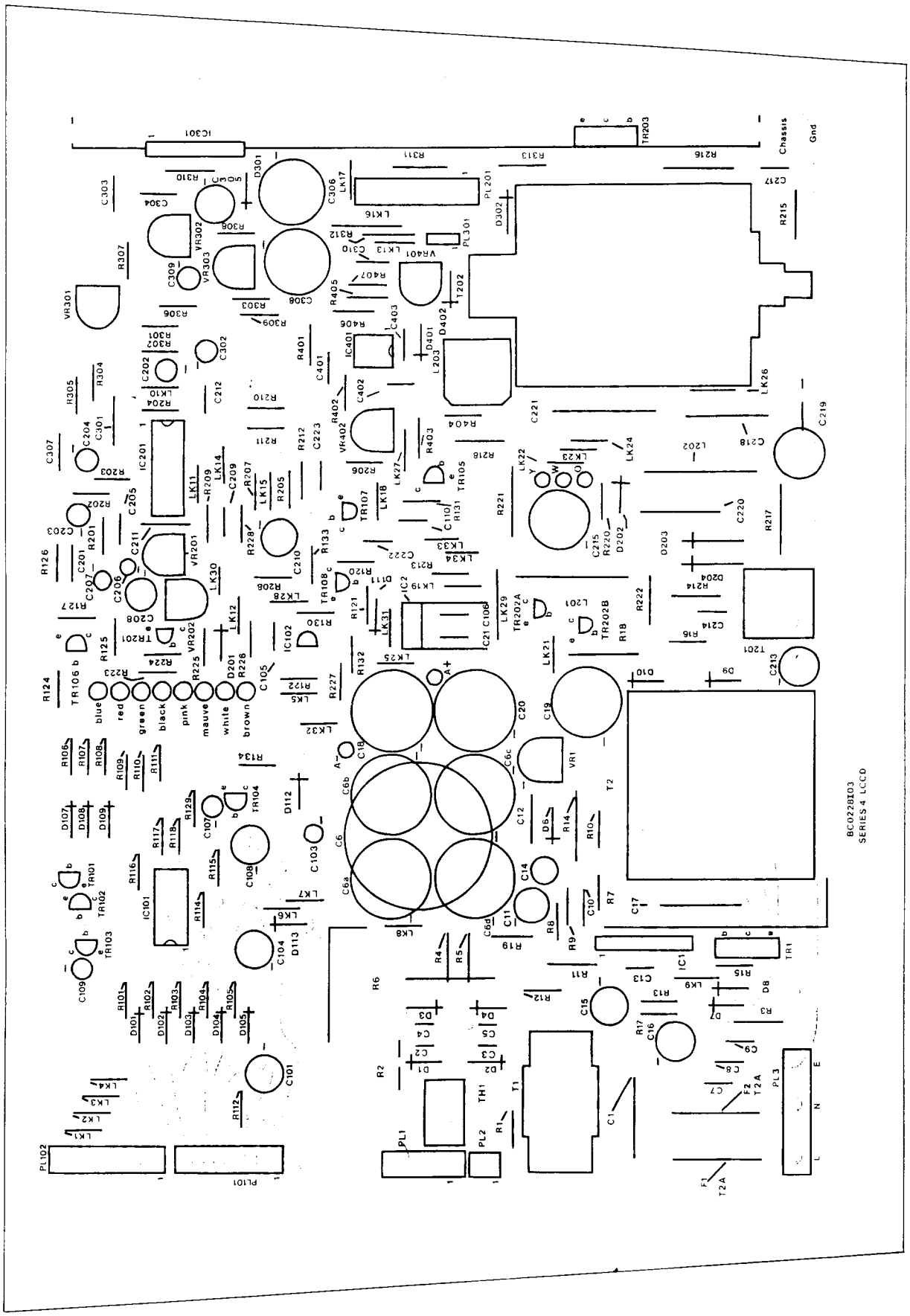
'Tube Base Panel' and the 'Main Chassis PCB' used for SERIES-4 Monitors.

In all cases, views are shown from the component side of the boards with component identification.

Track is shown 'viewed through' the boards.



CRT TUBE BASE PANEL - SERIES-4/5



MAIN CHASSIS PCB - 'SERIES-4'

PRINTED CIRCUIT BOARDS - SERIES-5

This section illustrates the printed circuit boards comprising:

Tube Base panel - SERIES-4/5.

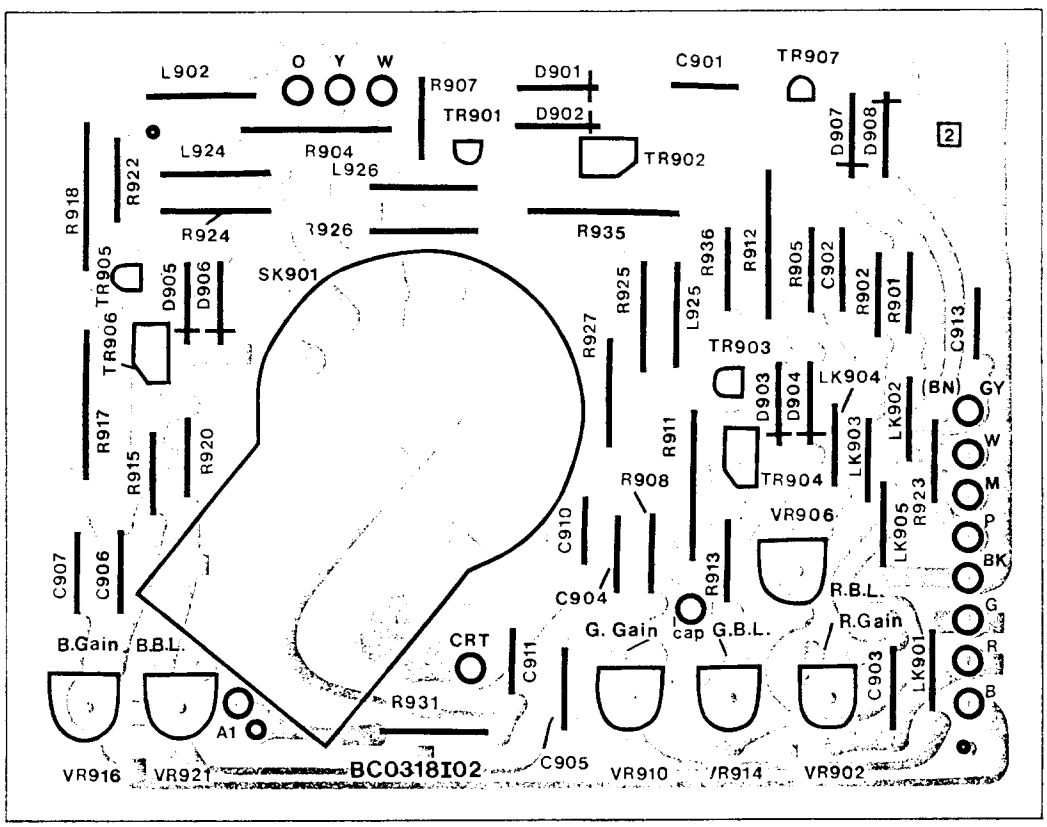
Main Drive/Deflection Board - SERIES-5.

Switched-Mode Power Supply - SERIES-5.

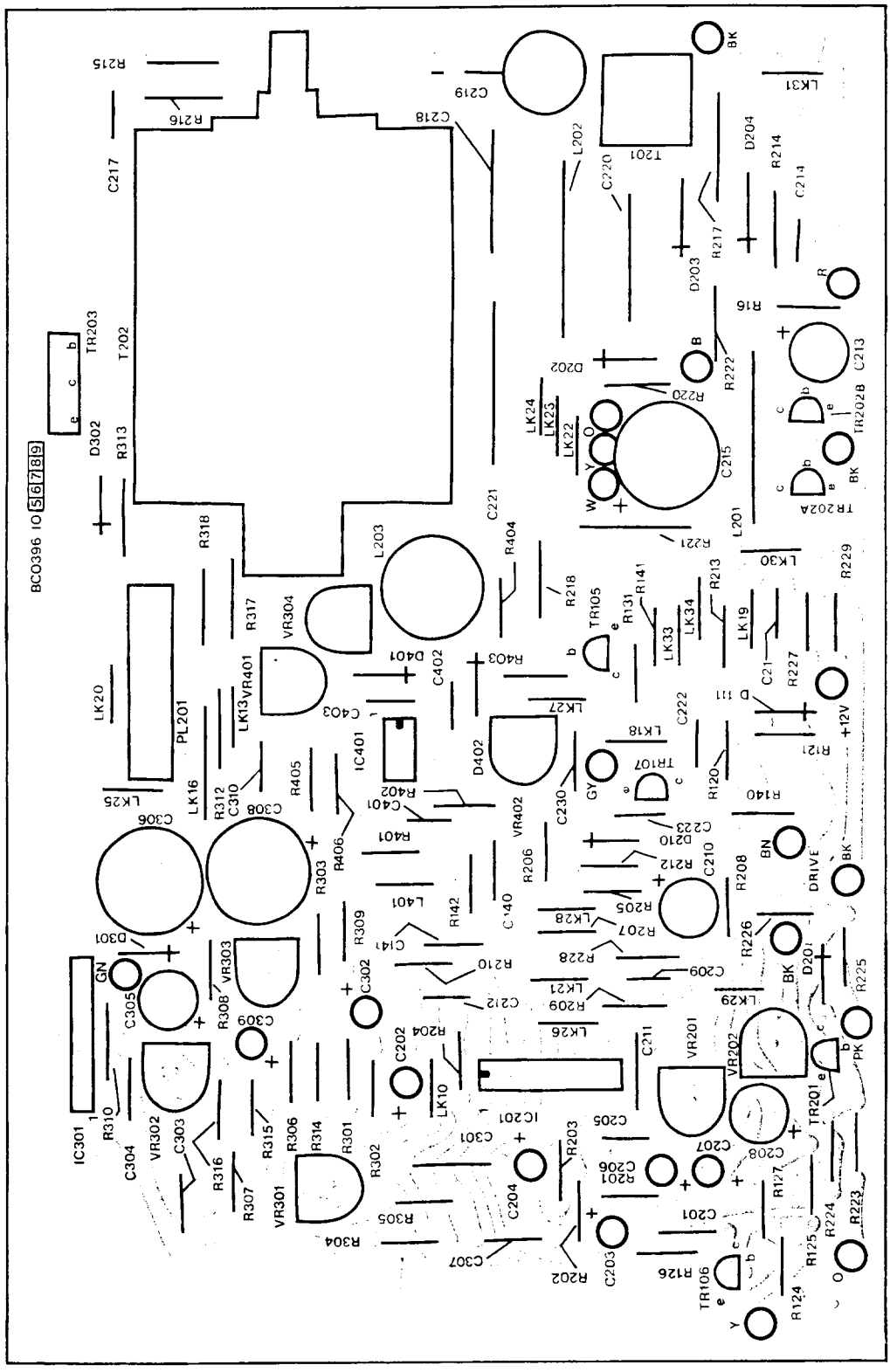
Analog Interface assembly - SERIES-5.

In all cases, views are shown from the component side of the boards with component identification.

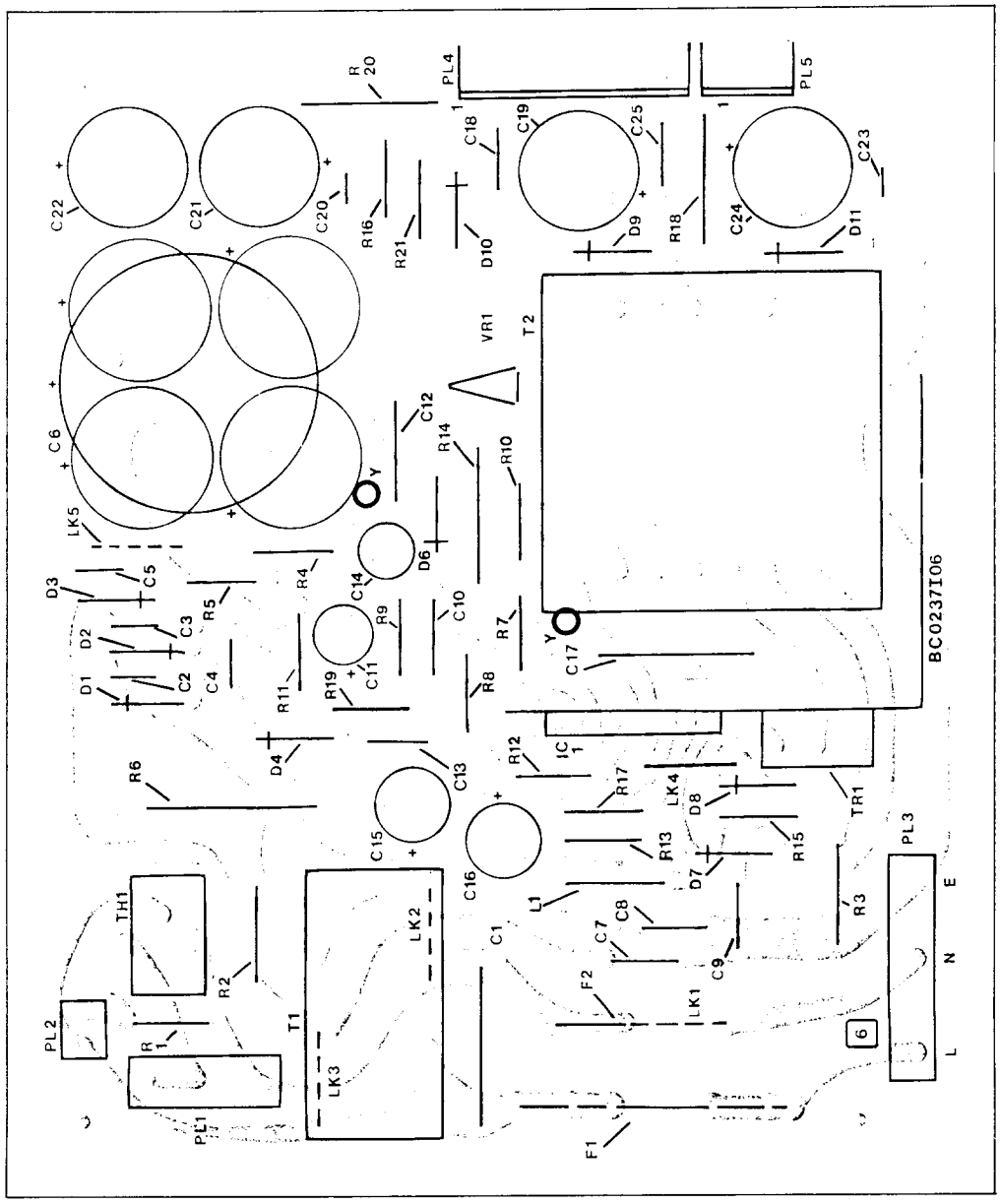
Track is shown 'viewed through' the boards.



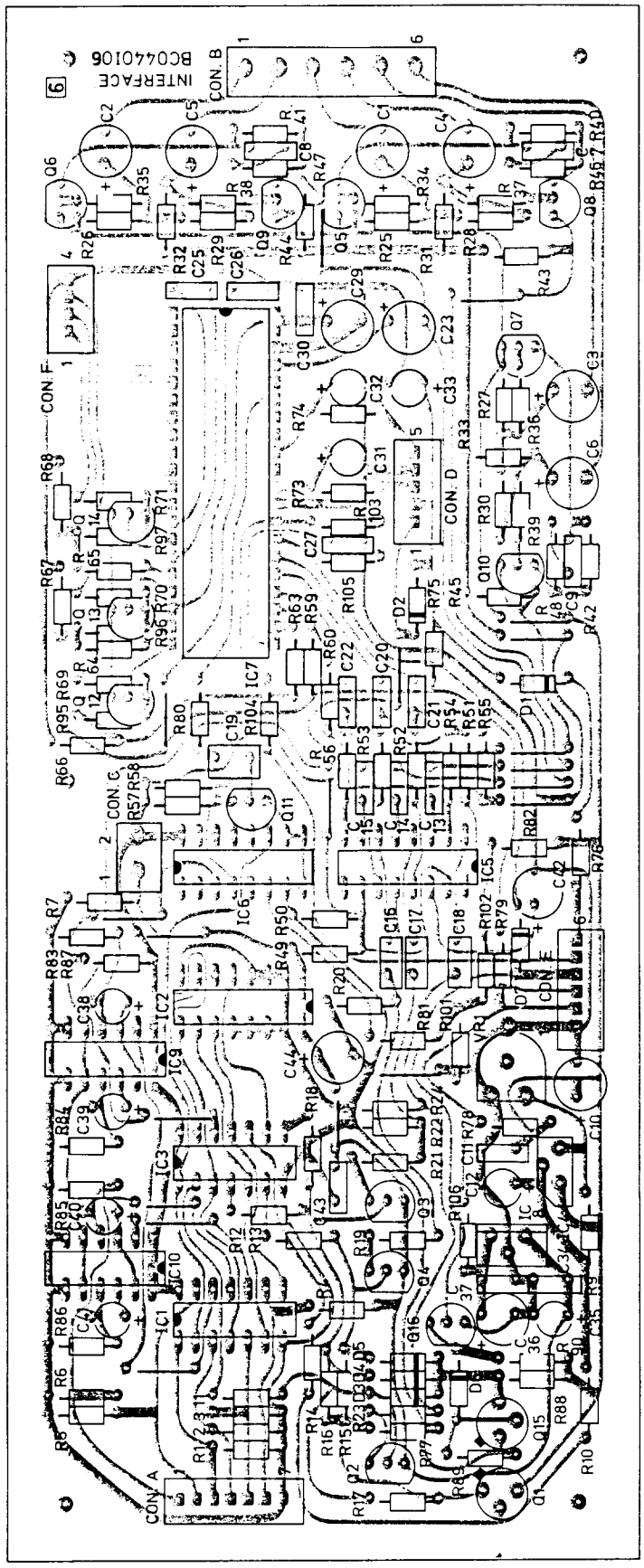
CRT TUBE BASE PANEL - SERIES-4/5



MAIN DRIVE/DEFLECTION BOARD - SERIES-5



SWITCHED-MODE POWER SUPPLY - SERIES-5



ANALOG INTERFACE PCB - SERIES-5

SERIES-4 - TTL VIDEO INTERFACE

GENERAL

Interface circuitry for the Series-4 Chassis is contained on the Main-Chassis PCB Assembly. This interface comprises IC101, transistors TR101 to TR104 together with associated components and circuitry for TTL operation.

INPUT/OUTPUT/INTERCONNECTION DETAILS

Input connection and 'customer' control connections, are made available on connector 'PL101', located on the Main-Chassis PCB.

On some models, output signals, etc, from the Video Interface, may be made available on connector 'PL102' when this is fitted. In standard format, these outputs are wired directly into the 'Main-Chassis' and 'Tube-Base' circuitry by 'Wire-Link' connectors (LK1 to LK4). Details of the connections described are provided in: Series-4 Main-Chassis and Tube-Base circuit diagram

Reference should be made to this diagram for input/output terminations and also for PCB interconnection and wiring 'colour code' details.

INPUT FACILITIES

Input facilities for the connection of TTL video signal inputs - is in standard format - provided by a 6-pin DIN socket.

This connector socket is normally located at the rear of the monitor.

Details of this socket and its 'pin-out' specifications are provided under: 'Technical Specifications - Series-4', in this manual.

INTERFACE CIRCUITRY VARIATIONS

When new or different models are introduced into the range, variations in the interface circuitry may occur.

Normally, major changes in this respect may be covered by separate supplementary sections and/or by separately issued Model Supplement sheets.

These 'Supplements' may be issued as occasion demands in accordance with product requirements.

PCB LAYOUT

PCB layout for the interface described is contained on the 'Series-4' Main-Chassis PCB. Reference should be made to this illustration for track and ident details of this part of the circuitry.

CIRCUIT DESCRIPTIONS REFERENCE

The circuit descriptions following should be read in conjunction with, and with reference to:

'Series-4' Main-Chassis and Tube-Base Circuit Diagram.

CIRCUIT DESCRIPTIONS

Video processing

R, G, and B, 'TTL compatible' video signals are applied to pins 10, 9 and 8 respectively of PL101. These are then fed, via CRT flashover protection diodes and resistors, to the inputs of gates 'c', 'd' and 'a' of IC101.

This is a quad 2-input 'exclusively-OR', open collector TTL IC. The unused inputs are tied to ground, configuring each gate as an open collector buffer.

The three open collector pull-up resistors are connected to voltage buffer TR104, whose base voltage is set by the 'Contrast' pot. This voltage determines the peak-video drive levels; i.e.: contrast.

Links LK2, 3 and 4 connect the video outputs of IC101 to pnp buffers TR101, 102 and 103. Zener diodes D107, 108 and 109 level-shift the buffer outputs, which are then applied to the 'Tube-Base' PCB video output stages.

Sync. Processing

Sync. inputs A and B are applied to pins 5 and 6 of PL101. These are fed, via CRT flashover protection diodes and resistors, to the inputs of gate 'b' of IC101.

a) For negative mixed sync., either input A or B can be used. The unused input is then pulled high (internal to IC101). The gate is then configured as an inverting buffer.

b) For positive separate sync., both inputs A and B are used. The gate is then configured as a non-inverting buffer.

The positive mixed sync. from the output of gate 'b' (pin 6) is applied, via level shifting resistors R114, 115, 124, 125 and link LK1, to the base of inverting amplifier TR106. This transistor sets the amplitude and DC level of the negative mixed sync. which is applied to pin 5, the sync. input pin of IC201.

SERIES-5 - ANALOGUE INTERFACE

GENERAL

The analogue interface circuitry employed with the Series-5 Chassis Assembly, is contained on a single separate printed circuit board.

This PCB assembly is coupled into the 'Series-5' Main Chassis, Modular System Assembly, by wiring harness and by plug and socket interconnections.

OUTPUT/SUPPLY/CONTROL CONNECTIONS

Output signals, 12V supply, and user controls on the Analogue Interface are taken from connectors, 'CON.E', 'CON.F', and 'CON.D' via suitable wiring harness, to hard-wired connections on the 'Series-5' Main-Chassis/Drive/Deflection Board PCB Assembly and to the 'user' controls.

INPUT FACILITIES

Inputs to the analogue interface are made via connector 'CON.B' on the Interface PCB, and a wiring harness/switch assembly, to 'BNC' type connectors on the monitor's cabinet back assembly.

INTERCONNECTION DETAILS

Main interconnection details for the Analogue Interface and other PCB assemblies forming the complete 'Series-5' Modular Chassis Assembly, are provided in:

'Series-5' - Analogue Monitor (1V/75R) interconnection diagram.

For full information, this diagram should be used in conjunction with:

'Series-5' - Analogue Interface circuit diagram (Single Standard 1V/75R)

'Series-5' - Main Chassis Assembly and Tube-Base circuit diagram.

INTERFACE CIRCUITRY VARIATIONS

From time-to-time, variations in the circuitry employed on the interface may vary in details as new or different models are introduced into the range.

Normally, major changes may be covered by separately issued Model Supplement sheets - these may be published on occasion in accordance with product requirements.

PCB LAYOUT

PCB layout for the 'Series-5 Analogue Interface' is shown in:

'Series-5' - Analogue Interface PCB layout'.

Reference may be made to this diagram for printed track and component identification detail.

CIRCUIT DESCRIPTION REFERENCES

The circuit descriptions following of the 'Series-5 Analogue Interface' should be read in conjunction with and with reference to:

'Series-5 Analogue Interface circuit diagram (Single Standard 1V/75R).

CIRCUIT DESCRIPTIONS

Video Processing

The interface input circuit accepts Red, 'Sync.-on-green', and Blue video input signals to 'RS170 Standards' (0.7V p-p video + 0.3V p-p mixed sync).

These BNC inputs are isolated from chassis ground and operate in differential mode, thereby rejecting 'common-mode' noise, that may be induced in long co-axial cable runs.

Each of the three video stages is identical. Operation of the Green video stage will be described.

Capacitors C2, C5, block DC current flow, allowing Q5, Q9 to be correctly biased as a differential non-inverting buffer. Resistors R26, R29, R32 form the biasing network, with R35, R38 as base-stopper resistors to ensure high-frequency stability.

Considering circuit operation with input B2 grounded and the 'green' signal applied to input B1. Transistor Q9 functions as a common base amplifier with the video signal applied to the base of 'emitter-follower' Q6 which, through R41, controls the emitter current of Q9. The output is taken from Q9 collector with the voltage-gain set by the ratio of R44 to R41. Resistor R47 and Capacitor C8, if fitted, provide high-frequency compensation.

The 'green' video signal (plus sync.), now referenced to ground and with an amplitude of approximately 0.66 times that of the input, is applied through 'clamping-capacitor' C21, to Pin 26 of IC7.

During the black-level portion of the video signal (back porch), Pin 26 is clamped to an internal reference ensuring a stable black-level independent of the DC level of the input signal. This clamping signal is the 'burst gate' portion of the SSC (super-sandcastle pulse), produced at Pin 17 of IC201, on the Drive/Deflection PCB. The SSC pulse also contains line and frame blanking information at different voltage levels.

Since the frame fly-back pulse is shorter than the 21-line (50Hz), or 17-line (60Hz) frame blanking portion of the SSC pulse, a 'potted down' version of the frame flyback pulse is fed to Pin 28 of IC7, for use as the frame-blanking signal. The frame-blanking portion of the 3-level SSC pulse is removed by level-shifting the SSC pulse down 2.0V, by diode D7, before feeding it to Pin 27 of IC7.

Capacitor C26 is the 'green' output clamping capacitor, intended for storing sampled beam current in the automatic black-level control circuit. In this application the output voltage is sampled, rather than the beam current.

During the first 3-lines after frame blanking (frame flyback), the internal video amplifiers are disabled and a reference level is outputted on Pin 17 of IC7. Q13 forms an emitter follower with its output fed-back, via R96, R67, R64, to Pin 19, which is the negative input to a comparator whose output drives C26. This forms a closed loop which stabilises the 'DC level' of the video output.

Contrast is controlled by a DC voltage of 0V to 5.1V, applied to Pin 32 of IC7 via the 'Contrast' pot. This controls the amplitude of the video output, (available at Pin 2 of 'Connector F'), from 0V to 3.5V peak-to-peak.

During beam-limiting conditions, the voltage at Pin 6 of 'Connector E', drops below 4.5V. Diode D1 then conducts, pulling diode D2 out of conduction, so reducing the track voltage of the Contrast pot - (Pin 2 of 'Connector D'), hence reducing video output drive.

The brightness is controlled by a DC voltage of 0V to 4.5V, applied to Pin 30 of IC7 via the Brightness pot. This controls the 'DC level' of the video output. This is nominally 2.7V with the control set to mid-range.

Sync. Processing

The 'Sync.-on-green' signal, is available at the collector of Q9, comprising approximately 0.2V of mixed 'negative-going' sync, below the 0.5V level of green video. This is fed via DC blocking capacitor C23, to Pin 37 of IC7. This pin is the input of an inverting amplifier with a voltage gain of X3.

The output, on Pin 35, of IC7 is fed via R80 to 'Connector E', Pin 3. The separation of the line and frame sync. from the green video, is performed by IC201, located on the Drive/Deflection PCB - Series-5 Chassis assembly.

ILLUSTRATED PARTS LIST

GENERAL

This section provides details of the cabinet assemblies currently used to house the various models in the SERIES-4 and SERIES-5 range of monitors.

CABINET STYLES

Three styles of cabinet are currently employed:

These are:-

1) 'D-SERIES' cabinets (moulded plastic)

2) 'M-SERIES' cabinets (metal construction)

3) 'N-SERIES' cabinets (metal construction)

These are shown in the accompanying illustrations. Reference should be made to the illustrations for the main component part make-up and identification of the assemblies.

LIST OF PARTS

When ordering spare or replacement parts, the Model number of the particular monitor should be quoted - together with the component reference taken from the Parts List following and the Serial No. of the individual product concerned.

MODEL			
1431/DS4F			**DESCRIPTION**
Comp. Ref			**'D-SERIES' CABINET**
PCO290I01			Cabinet front (facia/bezel)
PCO291I02			Cabinet (Back)
PCO292I02			Cabinet Door (Hinged)
M00221I04			Input & Interface bracket
AO1183I01			Interface Bracket Assembly
AO1184I01			Cabinet Front Assembly
AO1181I01			Cabinet Back Assembly
HK0002CP0			Knob - Black (SIFAM)
HK0003CP0			Knob Cap - Grey (SIFAM)

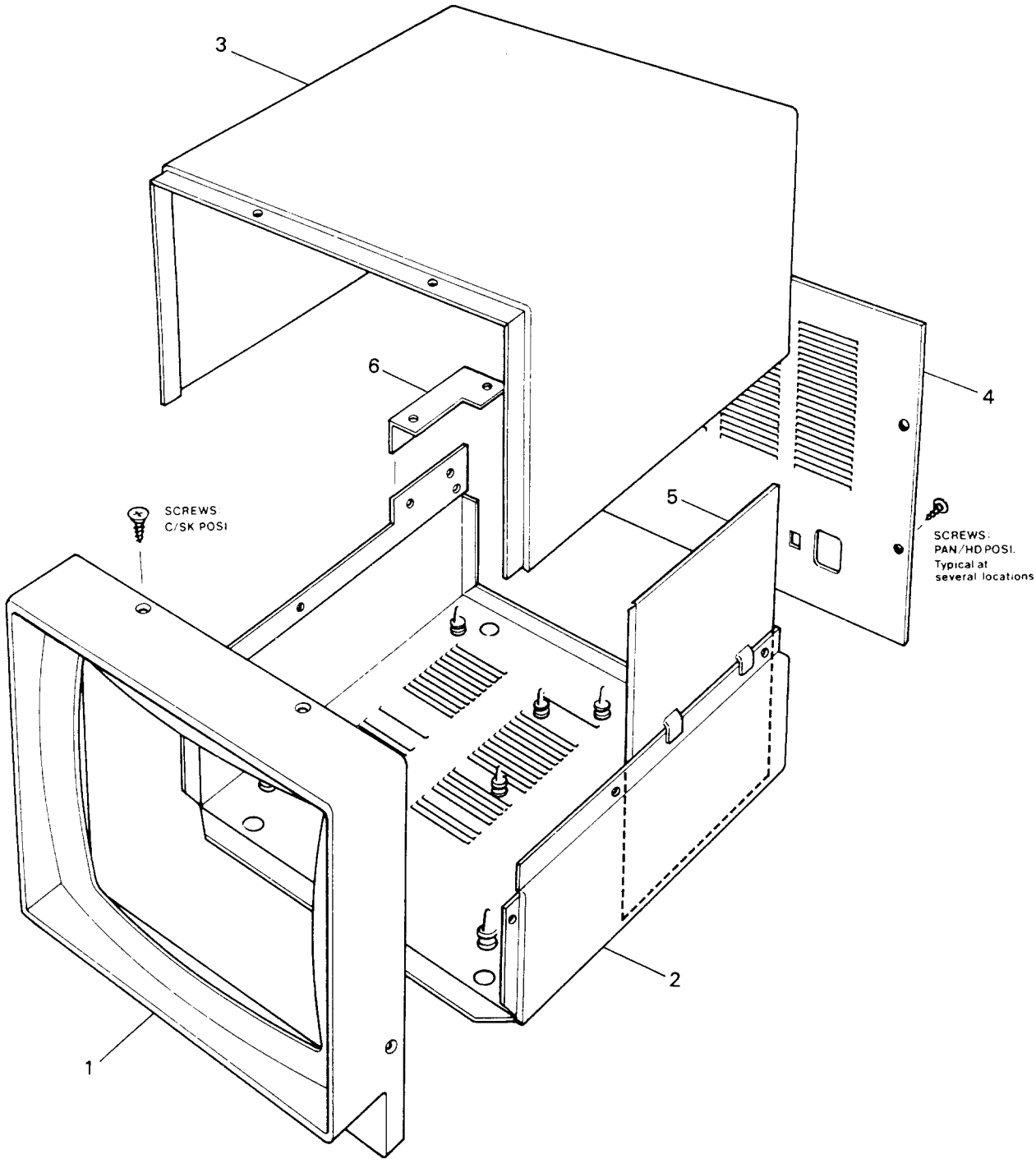
MODEL

1431/MS4F			DESCRIPTION
Comp. Ref			'M-SERIES' CABINET
MC0066I05			Cabinet Front (Brown)
MC0019I04			Cabinet Base (Beige)
MC0021I05			Cabinet Top (Beige)
MC0094I03			Cabinet Back (Beige)
AO1892I01			Cabinet Back Assembly
HK0002CP0			Knob - Black (SIFAM)
HK0003CP0			Knob Cap - Grey (SIFAM)

MODEL

12H529NS3			DESCRIPTION
Comp. Ref			'N-SERIES' CABINET
MC0430I04			Cabinet Front
MC0470I02			Cabinet Base
MC0429I03			Cabinet Top
MC0432I06			Cabinet Back
A02281I01			Cabinet Back Assembly
HK0002CP0			Knob - Back (SIFAM)
HK0004CP0			Knob Cap - Black (SIFAM)
M00686I03			Bracket PSU
M00719I01			Bracket LCR Capacitor Fixing

NOTE: These lists may be modified or added to from time to time as new, or different models are introduced into the Microvitec range of Monitors.

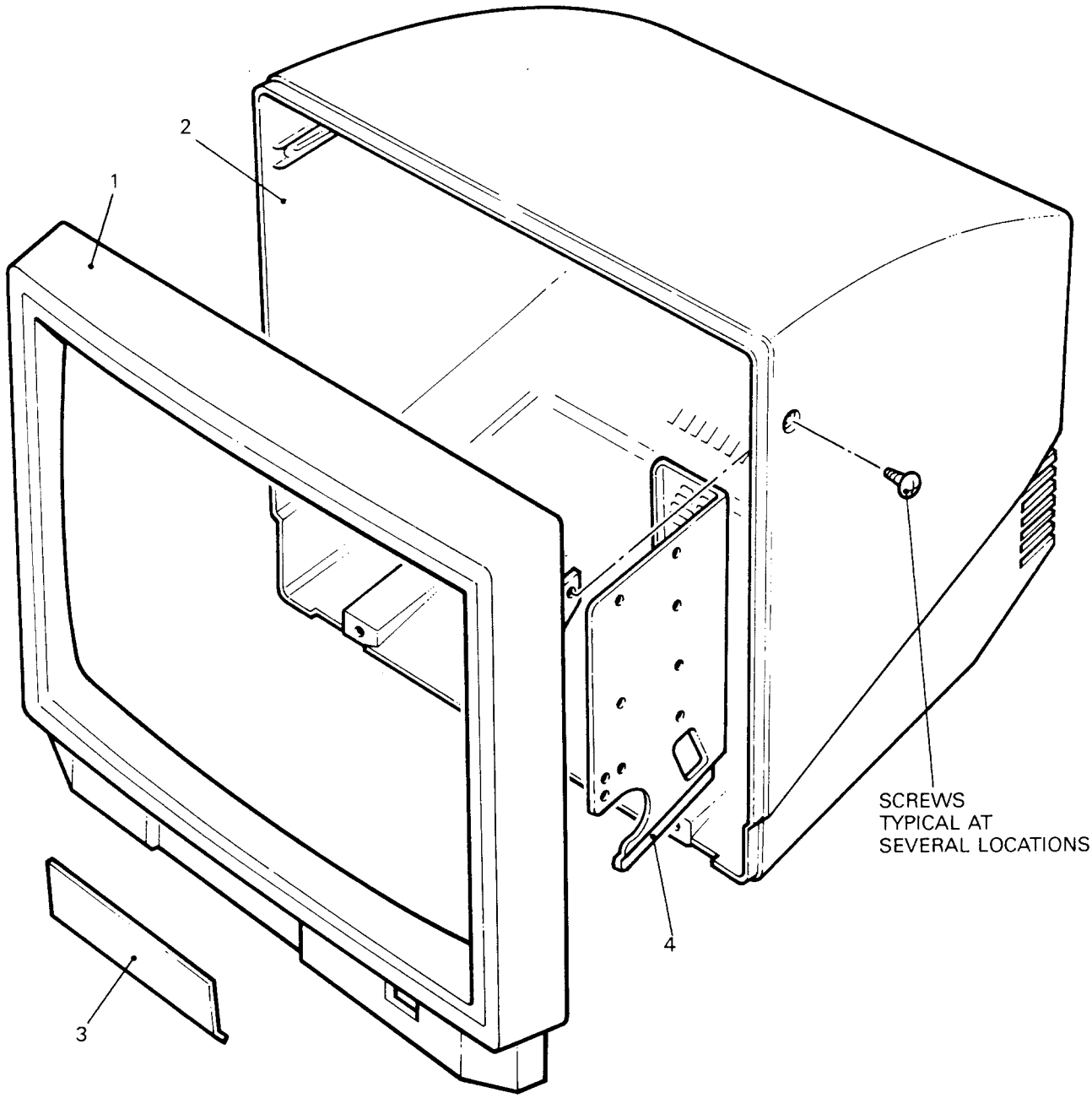


'N-SERIES' CABINET - 12 INCH MODEL

This cabinet is an all-metal, rugged construction.

'N-SERIES' CABINET COMPONENT PARTS

IDENT NO.	PART NO.	DESCRIPTION
1		CABINET FRONT
2		CABINET BASE
3		CABINET TOP
4		CABINET BACK
5		BRACKET PSU (SWITCHED-MODE PSU)
6		BRACKET LCR CAPACITOR FIXING

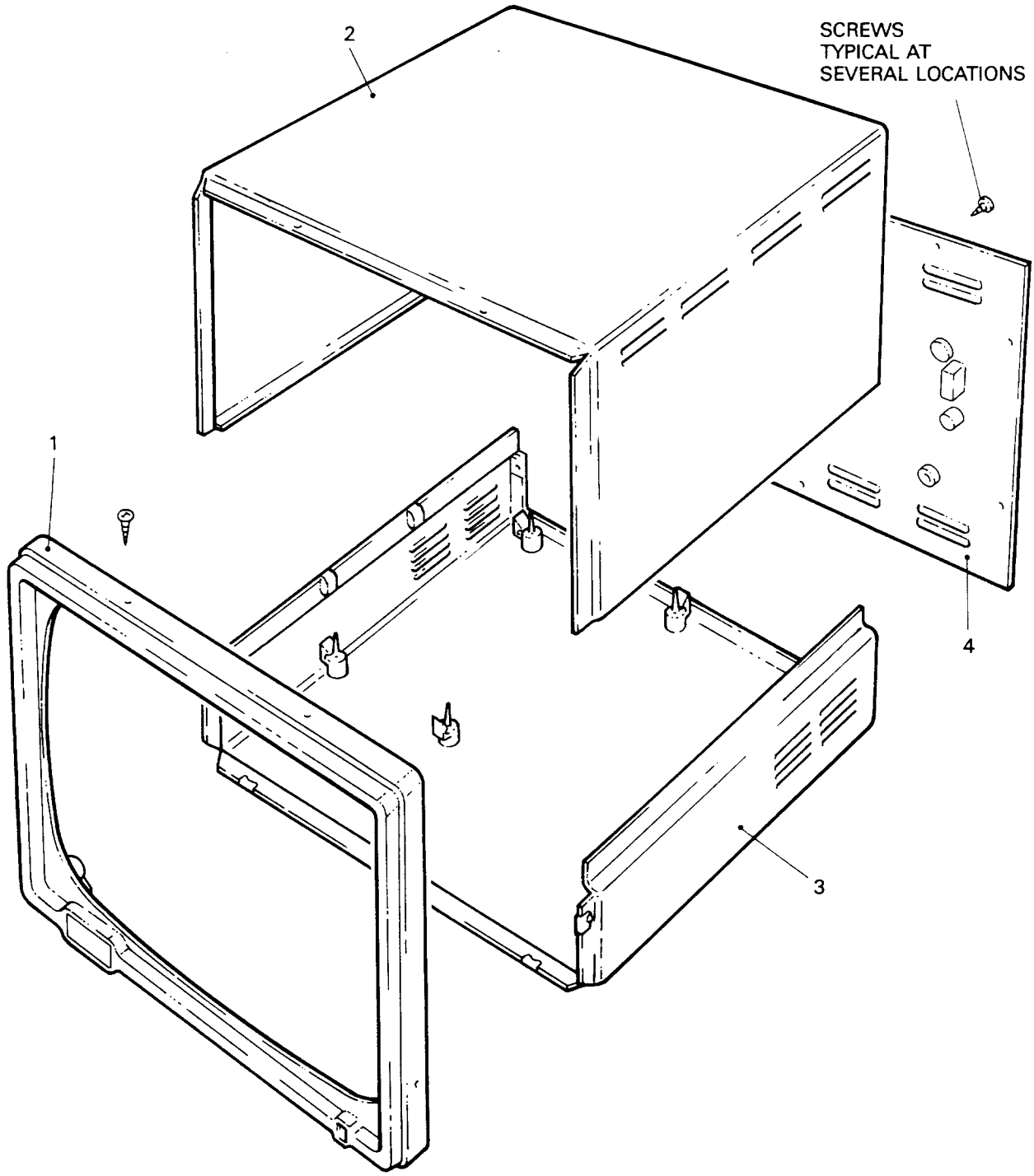


'D-SERIES' CABINET - 14 INCH MODEL

Injection moulded and is one of the latest designs offered in the MICROVITEC CUB monitor range and is available in different colours.

'D-SERIES' CABINET COMPONENT PARTS

IDENT NO.	PART NO.	DESCRIPTION
1		FACIA, CABINET BEZEL
2		CABINET
3		HINGED DOOR
4		INPUT BRACKET ASSEMBLY (METAL)



'M-SERIES' CABINET

This cabinet is an all metal, rugged construction.

'M-SERIES' CABINET COMPONENT PARTS

IDENT NO.	PART NO.	DESCRIPTION
1		FACIA, CABINET BEZEL
2		CABINET TOP/SIDE ASSEMBLY
3		CABINET BASE ASSEMBLY
4		CABINET BACK ASSEMBLY

LIST OF COMPONENTS - 'SERIES-4 & SERIES-5'

IMPORTANT

Components which are marked ⚠ on the Parts List and Circuit Diagram are Safety Approved types and should be replaced only by components supplied or approved by our Service Department.

It is also recommended that components not marked with the Safety symbol should be replaced by parts of the type originally fitted and this applies in particular to those resistors which are stood off the printed circuit board.

The manufacturers reserve the right to modify the design and to use or supply such alternative components as may be deemed necessary.

RESISTORS

The majority of the resistor components are standard 0.25W carbon film types. Differences in types of resistors that may be used are denoted as shown in the table following:

Resistor Types	Letter Code
CARBON FILM	C/F
CARBON COMPOSITION	C/C
METAL OXIDE	MET/O or M/O
FUSIBLE METAL FILM	FUS/F
WIRE WOUND	W/W
THERMISTOR	TH

CAPACITORS

In the list of capacitor components, the type is described by a letter code according to the schedule below:

Capacitor Type	Letter Code
ALUMINIUM ELECTROLYTIC	A/E
METALISED POLYESTER	M/P
POLYPROPYLENE	P/P
POLYCARBONATE	P/C
CERAMIC DISC	CER
CERAMIC TUBULAR	CER/T
POLYSTYRENE	P/S
TANTULUM DIELECTRIC	TANT

SERIES-4 MODEL 1431/MS4F - COMPLETE ASSEMBLIES

Assembly Reference	Assembly Description
A01889I01	Cabinet Assembly
A01890I01	Combined Assembly
A01891I01	Front Assembly
A01892I01	Back Assembly Rev 3
A00616I01	Base Assembly - 14 inch
A01894I01	Main PCB Assembly Rev 6
A01178I01	Tubebase Assembly STD/MED RES Rev 7
A01895I01	Tube Assembly
A01896I01	Neon Assembly
WA0025A02	Front Earth Lead Assembly
A02487I01	Composite Label
A00679I01	Cabinet DIN Skt (CMBD) 6
A01833I01	Potentiometer Assembly
A01175I01	Heatsink Assembly (SMPSU)
A01174I01	Heatsink Assembly (LOPT)
A02080I01	Potentiometer Assembly VR202
A01188I01	T.B. Harness No. 2 (5 leads)
A02690I01	Cabinet Back Warning

SERIES-4 MODEL 1431/DS4F - COMPLETE ASSEMBLIES

Assembly Reference	Assembly Description
A01181I01	Cabinet Back Assembly
A01182I01	Cabinet Assembly Rev 2
A01183I01	Interface Bkt. Assembly
A01184I01	Front Assembly
A01185I01	Combined Assembly
A01179I01	Main PCB Assembly
A01178I01	Tubebase Assembly STD/MED REJ Rev 7
A00968I01	Chassis Supp. Frame Sub Assembly
A02422I01	Earth Lead (1st used Series-4 'D')
A02746I01	Label Assembly
A01186I01	Potentiometer Assembly
A01175I01	Heatsink Assembly (SMPSU)
A01174I01	Heatsink Assembly (LOPT)
A02080I01	Potentiometer Assembly VR202
A01188I01	T.B. Harness No. 2 (5 leads)

SERIES-4 - MAIN PCB ASSEMBLY MODEL 1431

Circuit Reference	Component Reference	Component Description
RESISTORS		
R1	RF185DJ0	RESISTOR C/F 180K ¼W 5% - (MODELS MS4 only)
R2	RW220PK5	RESISTOR W/W 2R2 4W 10%
R3********** ⚠	RG336GJ0	RESISTOR MET/G 3M3 ½W 5%
R4,5	RF125GJ0	RESISTOR C/F 120K ½W 5%
R6	RW154RK5	RESISTOR W/W 15K 5W 10% PLG
R7	RF123DJ0	RESISTOR C/F 1K2 ¼W 5%
R8,109,110,111,112,122	RF222DJ0	RESISTOR C/F 220R ¼W 5%
R9,206,401	RF104DJ0	RESISTOR C/F 10K ¼W 5%
R10,207	RF154DJ0	RESISTOR C/F 15K ¼W 5%
R11,19	RF824GJ0	RESISTOR C/F 82K ½W 5%
R12,301	RF105DJ0	RESISTOR C/F 100K ¼W 5%
R13,17	RF120DJ0	RESISTOR C/F 1R2 ¼W ± 5%
R14	RO122LJ0	RESISTOR MET/O 120R 2W 5%
R15	RF271DJ0	RESISTOR C/F 27R ¼W 5%
R16,227********** ⚠	RL470DJ0	RESISTOR FUS/F 4R7 ¼W 5%
R18	RO470LJ0	RESISTOR MET/O 4R7 2W 5%
R101,102,103,104,105	RF152DJ0	RESISTOR C/F 150R ¼W 5%
R106,107,108,404	RF102DJ0	RESISTOR C/F 100R ¼W 5%
R114,124,126,223,305	RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R115	RF683DJ0	RESISTOR C/F 6K8 ¼W 5%
R116,117,118,212,225	RF472DJ0	RESISTOR C/F 470R ¼W 5%
R120	RF823DJ0	RESISTOR C/F 8K2 ¼W 5%
R121	RF105DJ0	RESISTOR C/F 100K ¼W 5%
R125,224	RF273DJ0	RESISTOR C/F 2K7 ¼W 5%
R127	RF153DJ0	RESISTOR C/F 1K5 ¼W 5%
R129,213,303	RF103DJ0	RESISTOR C/F 1K0 ¼W 5%
R131	RF564DJ0	RESISTOR C/F 56K ¼W 5%
R132	RF222DJ0	RESISTOR C/F 220R ¼W 5%
R134,203,402	RF473DJ0	RESISTOR C/F 4K7 ¼W 5%
[illegible]	RF822DJ0	RESISTOR C/F 820R ¼W 5%
[illegible]	RF821DJ0	RESISTOR C/F 82R ¼W 5%
R204	RF564DJ0	RESISTOR C/F 56K ¼W 5%
R205	RF103DJ0	RESISTOR C/F 1K0 ¼W 5%
R208	RF334DJ0	RESISTOR C/F 33K ¼W 5%
R209	RF274DJ0	RESISTOR C/F 27K ¼W 5%
R210	RF332DJ0	RESISTOR C/F 330R ¼W 5%
R214	RF471GJ0	RESISTOR C/F 47R ½W 5%
R215	RO100JJ0	RESISTOR MET/O 1R0 1W 5%
R216	RF271GJ0	RESISTOR C/F 27R ½W ± 5%
R217	RO470LJ0	RESISTOR MET/O 4R7 2W 5%
R218	RO103LJ0	RESISTOR M.O. 1K 2W ± 5%
R220********** ⚠	RL101GJ0	RESISTOR FUS/F 10R ½W 5%
R221	RO270LJ0	RESISTOR MET/OXIDE 2R7 2W 5%

Circuit Reference	Component Reference	Component Description
RESISTORS (Continued)		
R222	RO100JJ0	RESISTOR MET/O 1R0 1W 5%
R226	RF393DJ0	RESISTOR C/F 3K9 ¼W 5%
R228	RF564DJ0	RESISTOR C/F 56K ¼W 5%
R304	RF683DJ0	RESISTOR C/F 6K8 ¼W 5%
R306	RF474DJ0	RESISTOR C/F 47K ¼W 5%
R307	RF274DJ0	RESISTOR C/F 27K ¼W 5%
R308	RF120DJ0	RESISTOR C/F 1R2 ¼W ± 5%
R309	RF823DJ0	RESISTOR C/F 8K2 ¼W 5%
R310	RF332GJ0	RESISTOR C/F 330R ½W ± 5%
R311	RF183GJ0	RESISTOR C/F 1K8 ½W ± 5%
R312	RF332GJ0	RESISTOR C/F 330R ½W ± 5%
R313********** ⚠	RL470GJ0	RESISTOR FUS/F 4R7 ½W 5%
R403	RF184DJ0	RESISTOR C/F 18K ¼W 5%
R405	RF100DJ0	RESISTOR C/F 1R0 ¼W 5%
R406	RF104DJ0	RESISTOR C/F 10K ¼W 5%
PREF. TO 10mm C110	RF475DJ0	RESISTOR C/F 470K ¼W 5%
TH1	RT005QN0	THERMISTOR 263100P2332T333
MOUNT VERT. BETWEEN E & C TR108	RF472DJ0	RESISTOR C/F 470R ¼W 5%
POTENTIOMETERS		
VR1,201	RQ104AL2	POT. PRESET 10K 0.1W 20% HZ
VR202	AO2080I01	POT. ASSY. - VR202 SERIES-4
VR301	RQ225AL2	POT. PRESET 220K 0.1W 20% HZ
VR302	RQ103AL2	POT. PRESET 1K0 0.1W 20% HZ
VR303	RQ103AL2	POT. PRESET 1K0 0.1W 20% HZ
VR401	RQ473AL2	POT. PRESET 4K7 0.1W 20% HZ
VR402	RQ105AL2	POT. PRESET 100K 0.1W 20% HZ
CAPACITORS		
C1********** ⚠	CX225NL6	CAPACITOR MET/P 0.22µF 250V
C2,3,4,5	CD472YL6	CAPACITOR CER. 470pF 2KV
C6	CA108RM7	CAPACITOR ALUM/ELEC 100µF 385V
C7********** ⚠	CY103NL6	CAPACITOR CER. 1000pF 250V
C10	CK271JJ0	CAPACITOR CERAMIC/T 27pF 50V
C11,15,16	CA108FM7	CAPACITOR ALUM/E 100µF 25V
C12	CA106JL0	CAPACITOR ALUM/E 1µF 50V
C13,217	CM104TL6	CAPACITOR MET/P 0.01µF 630V
C14	CL6838J6	CAPACITOR P/P 6n8 63V 5%
C17********** ⚠	CL153YJ6	CAPACITOR P/P 1n5 2000V 5%
C18	CA229FL7	CAPACITOR A/E 2200µF 25V 20%
C19,215	CA227NM7	CAPACITOR ALUM/E 22µF 250V 50%
C20	CA477NM7	CAPACITOR ALUM/E 47µF 250V
C101	CA107JL7	CAPACITOR A/ELEC 10µF 50V 20% RAD PR

Circuit Reference	Component Reference	Component Description
CAPACITORS (Continued)		
C103	CA227FM7	CAPACITOR ALUM/E 22µF 25V 50%
C105,106,212,222,310	CM105NK6	CAPACITOR MET/P 100nF 250V
C108,208,213	CA228FM7	CAPACITOR ALUM/E 220µF 25V
C202,206,302	CA107JL7	CAPACITOR A/ELEC 10µF 50V 20% RAD PR
C203	CA227FM7	CAPACITOR ALUM/E 22µF 25V 50%
C204	CA106JL7	CAPACITOR ALUM/E 1µF 50V
C205	CM155KK6	CAPACITOR MET/P 150nF 100V
C207	CA476JL7	CAPACITOR A/ELEC 4.7µF 50V 20%
C209,214,223	CM474NK6	CAPACITOR MET/P 47nF 250V 10%
C211	CL273MI0	CAPACITOR P/P 2n7 160V 2% AXIAL
C218********** ⚠	CL913XJ6	CAPACITOR P/P 9n1 1500V 5%
C219********** ⚠	CL274NJ6	CAPACITOR P/P 27nF 250V DC 5%
C220	CB226KK6	CAPACITOR POLY/C 2u2 100V 10%
C221********** ⚠	CL685NJ6	CAPACITOR P/P 680nF 250V 5%
C301	CM685KK6	CAPACITOR MET/P 680nF 100V 10%
C303	CK104FL0	CAPACITOR CER/T 10nF 25V 20%
C304	CK682JK0	CAPACITOR CER/T 680pF 50V 10%
C305	CA108HM7	CAPACITOR ALUM/E 100µF 35V 50%
C306,308	CA109IN7	CAPACITOR ALUM/ELEC 1000µF 40V
C307,403	CK223JK0	CAPACITOR CER/T 2n2 50V 10%
C309	CA107JL7	CAPACITOR A/ELEC 10µF 50V 20% RAD PR
C401	CM224RK6	CAPACITOR MET/POLY 22nF 400V
C402	CM474NK6	CAPACITOR MET/P 47nF 250V 10%
ADD PIN 9 TO PIN 12 IC201	CD1028K6	CAPACITOR CER. 100pF 63V 10%
	CA107JL7	CAPACITOR A/ELEC 10uF 50V 20% RAD PR
DIODES		
D1,2,3,4	DP4007UU0	DIODE IN4007 UNIVERSAL Pt. No.
D6,7,202	DF0157UE0	DIODE BA157
D8,301	DP4002UM0	DIODE IN4002
D302	DF0157UE0	DIODE BA157 (MODELS DS4 ONLY)
D9	DF0814UM0	DIODE MR814
D10	DF0818UU0	DIODE SWITCHING, 1A 1000V
D101,102,103,104	DS4148UT0	DIODE IN4148 THOMSON
D105,112,113,201,401	DS4148UT0	DIODE IN4148 THOMSON
D107,108,109,111	DZ79560FB0	DIODE ZENER BZX79B5V6 2%
D203	DF0448UP0	DIODE BY448 MULLARD
D204	DF0096DP0	DIODE BYV96D
D302	DF0159UE0	DIODE BA159 EASBY
TRANSISTORS		
TR101,102,103	QS4125UM5	TRANSISTOR 2N4125 MOTOROLA
TR104,105	QS0337UT0	TRANSISTOR BC337-RL1
TR106,107	QS4125UM5	TRANSISTOR 2N4125 MOTOROLA
TR201	QS4123UF0	TRANSISTOR 2N4123 FERRANTI
TR202A,TR202B	QS0337UT0	TRANSISTOR BC337-RL1

Circuit Reference	Component Reference	Component Description
INTEGRATED CIRCUITS		
IC101	IT74136MU2	CIRCUIT INT. SN74LS136N
IC102	IV7805LX0	CIRCUIT INT. 78L05
IC201	IL2578AP2	CIRCUIT INT. TDA2578A
IC401	IL4950US2	CIRCUIT INT. TDA4950
TRANSFORMERS		
T1	LM0002UA1	CHOKE MAINS FILTER 18mH
T2********** ⚠	TO0400IO1	TRANSFORMER 120/12
T201	TL002DU0	TRANSFORMER LINE OPT DRIVER
T202********** ⚠	TL0001AU3	TRANSFORMER DIODE SPLIT FLY/BK
CHOKES & COILS		
L201	LO0368IO1	CHOKE 9mH AXIAL LINE MODULATOR
L202	LO0367IO1	CHOKE - 600µH AXIAL MULTILAYER
L203	LN002UA5	COIL LINEARITY PC5580
CONNECTORS		
PL1 DEGAUSS COIL	KP0320DO3	PLUG 3 PIN 320/3763 0.3" + 0.2"
PL2 NEON	KP0025AO3	PLUG 3 WAY 20/3443 PRESSAC
PL3 MAINS LEAD	KP0300DO5	PLUG 5 WAY 320/3765
MISCELLANEOUS		
F1 T 2A	KS0003YO1	FUSEHOLDER L222/K
	AO1175I01	HEATSINK ASSY. (SMPSU) SERIES-4
	AO1174I01	HEATSINK ASSY. (LOPT) SERIES-4

SERIES-4 - TUBE BASE ASSEMBLY - STANDARD/MEDIUM RESOLUTION

Circuit Reference	Component Reference	Component Description
RESISTORS		
R901 BAND TO D908	DZ79121FR0	DIODE ZENER BZX79B12V 2%
R902,908,913,915,920	RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R904,912,918	R0154LJ0	RESISTOR MET. OXIDE 15K 2W 5%
R905 FITTED AS SAMPLE	RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R907,922,936**********	⚠ RL102DJ0	RESISTOR M/FUS 100R ¼W 5%
R911,917,935	RF474JJ0	RESISTOR C/F 47K 1W 5%
R923	RF472DJ0	RESISTOR C/F 470R ¼W 5%
R924,925,926	RK222GK0	RESISTOR C.COMP. 220R ½W
R927	RK105GK0	RESISTOR C/C 100K ½W 10%
R931	RK103GK0	RESISTOR C/C 1K0 ½W 10%
VR902,910,916	RQ103AL2	POT. PRESET 1K0 0.1W 20% HZ
VR906,914,921	RQ473AL2	POT. PRESET 4K7 0.1W 20% HZ
CAPACITORS		
C901	CM105NK6	CAPACITOR MET/P 100nF 250V 10%
C902	CK331JJ0	CAPACITOR CERAMIC/T 33pF 50V
C903,907	CK122JJ0	CAPACITOR CERAMIC/T 120pF 5%
C904,906	CK271JJ0	CAPACITOR CERAMIC/T 27pF 50V
C905	CK681JJ0	CAPACITOR CERAMIC/T 68pF 50V
C910,911	CD104YL7	CAPACITOR CER. 10nF 2KV 20%
DIODES		
D901,902,903	DS4148UT0	DIODE IN4148 THOMSON
D904,905,906,908	DS4148UT0	DIODE IN4148 THOMSON
D907	DZ88750FC0	DIODE BZY88C7V5
TRANSISTORS		
TR901,903,905	QS0042UM0	TRANSISTOR MPSA42
TR902,904,906	QS0869UA0	TRANSISTOR BF869
TR907	QS4123UM0	TRANSISTOR 2N4123 MOTOROLA
CHOKES		
L902,924,925,926	LW154SK2	CHOKE 15µH B78108-T1153-K

SERIES-4 - HEAT SINK ASSEMBLY (SMPSU)

Circuit Reference	Component Reference	Component Description
TRANSISTOR		
TR1	QQ4051UX0	TRANSISTOR R4051 TYPE N UNPREF
INTEGRATED CIRCUIT		
IC1	IW4600UV4	CIRCUIT INT. TDA4600 SMPPS CON
	MO0391I03	BKT.HEATSINK - POWER SUPPLY
	HC0005AB0	CLIP-POWER TRANSISTOR MOUNTING

SERIES-4 - HEAT SINK ASSEMBLY (LOPT)

Circuit Reference	Component Reference	Component Description
TRANSISTOR		
TR203	QQ4050UX0	TRANSISTOR R4050 TYPE N UNPREF
INTEGRATED CIRCUIT		
IC301	IL3651UP2	CIRCUIT INT. TDA3651
	MO0392I05	BKT. HEATSINK
	HC0005AB0	CLIP-POWER TRANSISTOR MOUNTING

SERIES-5 MODEL 12H529NS3 - COMPLETE ASSEMBLIES

Assembly Reference	Assembly Description
A02279I01	Cabinet Assembly
A02280I01	Front Assembly
A02281I01	Back Assembly
A02285I01	Base Assembly
A01709I01	Scan Coil Lead Assembly - 12H526PA1
A01808I01	Earth Lead Assembly M5-M4 RING
A02338I01	Earth Lead Assembly 200mm
A01787I01	Lead Assembly - Analogue (Lead B)
A01976I01	Earth Lead Assembly - M2220
A01777I01	PSU Bkt. Assembly
A02415I01	I/F PCB Assembly
A01714I01	PSU PCB Assembly - Rev 3
A01779I01	Potentiometer Assembly Controls - 1240/NR3
A01774I01	Tubebase PCB Assembly - 1240/NR3 Rev 6
A02412I01	Drive Deflection PCB Assembly
A02410I01	Combined Assembly
A01700I01	Heatsink Assembly (LOPT)
A02856I01	EHT Capacitor Bkt. Sub Assembly - 1246/FA1
A01789I01	Lead Assembly - Drive I/F Lead E
A01698I01	PSU Harness No. 2
A01790I01	Lead Assembly - I/F to Tubebase
A01491I01	Heatsink Assembly (SMPSU)
A01780I01	EHT Capacitor Assembly

SERIES-5 -ANALOGUE INTERFACE PCB ASSEMBLY MODEL 12H529NS3

Circuit Reference	Component Reference	Component Description
RESISTORS		
R25,26,27	RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R28-30	RF393DJ0	RESISTOR C/F 3K9 ¼W 5%
R31-33	RF563DJ0	RESISTOR C/F 5K6 ¼W 5%
R34-39,69,70,71	RF471DJ0	RESISTOR C/F 47R ¼W 5%
R40-42,66-68	RF152DJ0	RESISTOR C/F 150R ¼W 5%
R43-45	RF102DJ0	RESISTOR C/F 100R ¼W 5%
R59,75	RF473DJ0	RESISTOR C/F 4K7 ¼W 5%
R60,106	RF472DJ0	RESISTOR C/F 470R ¼W 5%
R63-65,105	RF104DJ0	RESISTOR C/F 10K ¼W 5%
R73,74	RF474DJ0	RESISTOR C/F 47K ¼W 5%
R76	RF222DJ0	RESISTOR C/F 220R ¼W 5%
R78********** ⚠	RL470DJ0	RESISTOR FUS/F 4R7 ¼W 5%
R79********** ⚠	RL220DJ0	RESISTOR FUS/F 2R2 ¼W 5%
R80	RF822DJ0	RESISTOR C/F 820R ¼W 5%
R95,96,97	RF821DJ0	RESISTOR C/F 82R ¼W 5%
R103	RF103DJ0	RESISTOR C/F 1K0 ¼W 5%
R104	RF333DJ0	RESISTOR C/F 3K3 ¼W 5%
CAPACITORS		
C1-6,10,23,29,36	CA108FM7	CAPACITOR ALUM/E 100µF 25V
C20-22,11,30,37	CM1058K6	CAPACITOR MET/P 0.1µF 63V 10%
C25,26,27	CM2248K6	CAPACITOR M/POLY 22nF 63V 10%
C31,32	CA106JL7	CAPACITOR ALUM/E 1µF 50V 20%
C33	CA227FM7	CAPACITOR ALUM/E 22µF 25V
DIODES		
D1,2	DS4148UT0	DIODE IN4148
D7	DZ46200FB0	DIODE REFERENCE BZV46C2V0
C35 AS PER SAMPLE	DZ79430FB0	DIODE ZENER BZX79B4V3 2%
TRANSISTORS		
Q5-7,12-14	QS4123UM0	TRANSISTOR 2N4123 MOTOROLA
Q8,9,10	QS4125UM5	TRANSISTOR 2N4125 MOTOROLA
INTEGRATED CIRCUITS		
IC7	IL3301UM3	CIRCUIT INT. TDA3301 SELECTED
MISCELLANEOUS		
CONNECTOR F	KP0025A04	PLUG 4 WAY 20/3444
CONNECTOR E	KP0025A06	CONNECTOR 6 WAY PRESAC 20/3446
CONNECTOR D	KP0026A05	PLUG 5 WAY 20/3445
CONNECTOR B	KP0025A11	CONNECTOR 11 WAY 20/3451-BDFHK

SERIES-5 - POWER SUPPLY UNIT PCB ASSEMBLY

Circuit Reference	Component Reference	Component Description
RESISTORS		
R2	RW220PK5	RESISTOR W/W 2R2 4W 10%
R3********** ⚠	RG336GJ0	RESISTOR MET/G 3M3 ½W 5%
R4,5	RF125GJ0	RESISTOR C/F 120K ½W 5%
R6	RW154RK5	RESISTOR W/W 15K 5W 10% PLG
R7	RF123DJ0	RESISTOR C/F 1K2 ¼W 5%
R8	RF222DJ0	RESISTOR C/F 220R ¼W 5%
R9	RF104DJ0	RESISTOR C/F 10K ¼W 5%
R10	RF154DJ0	RESISTOR C/F 15K ¼W 5%
R11,19	RF824GJ0	RESISTOR C/F 82K ½W 5%
R12	RF105DJ0	RESISTOR C/F 100K ¼W 5%
R13,17	RF120DJ0	RESISTOR C/F 1R2 ¼W ± 5%
R14	RO122LJ0	RESISTOR MET/O 120R 2W 5%
R15	RF271DJ0	RESISTOR C/F 27R ¼W 5%
R16	RF125DJ0	RESISTOR C/F 120K ¼W 5%
R20	RO470LJ0	RESISTOR MET/O 4R7 2W 5%
TH1	RT005QN0	THERMISTOR 263100P2332T333
VR1	RQ104AL2	POT. PRESET 10K 0.1W 20% HZ
CAPACITORS		
C1**********CLASS X	CX225NL6	CAPACITOR MET/P 0.22µF 250V
C2,3,4,5	CD472YL6	CAPACITOR CER. 470pF 2KV
C6a,b,c,d	CA108NL7	CAPACITOR A/E 100µF 250V
C7,8,9**********CLASS Y	CY103NL6	CAPACITOR CER. 1000pF 250V
C10	CK271JJ0	CAPACITOR CERAMIC/T 27pF 50V
C11,15,16	CA108FM7	CAPACITOR ALUM/E 100µF 25V
C12	CA106JL0	CAPACITOR ALUM/E 1µF 50V
C13	CM104TL6	CAPACITOR MET/P 0.01µF 630V
C14	CL6838J6	CAPACITOR P/P 6n8 63V 5%
C17********** ⚠	CL153YJ6	CAPACITOR P/P 1n5 2000V 5%
C20,23	CD472SK7	CAPACITOR CER. 470pF 500V
C21	CA227NM7	CAPACITOR ALUM/E 22µF 250V 50%
C22	CA477NM7	CAPACITOR ALUM/E 47µF 250V
C24	CA229FL7	CAPACITOR A/E 2200µF 25V 20%
C25	CM105NK6	CAPACITOR MET/P 100nF 250V 10%
DIODES		
D1,2,3,4	DP4007UU0	DIODE IN4007 UNIVERSAL PT. NO.
D6,7	DF0157UF0	DIODE BA157
D8	DP4002UM0	DIODE IN4002
D10	DF0818UU0	DIODE SWITCHING, 1A 1000V
D11	DF0814UM0	DIODE MR814

SERIES-5 - MAIN PCB ASSEMBLY

Circuit Reference	Component Reference	Component Description
RESISTORS		
R16,227********** ⚠	RL470DJ0	RESISTOR FUS/F 4R7 ¼W 5%
R120	RF823DJ0	RESISTOR C/F 8K2 ¼W 5%
R121	RF105DJ0	RESISTOR C/F 100K ¼W 5%
R124	RF273DJ0	RESISTOR C/F 2K7 ¼W 5%
R125	RF273DJ0	RESISTOR C/F 2K7 ¼W 5%
R126,305	RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R127	RF123DJ0	RESISTOR C/F 1K2 ¼W 5%
R131	RF564DJ0	RESISTOR C/F 56K ¼W 5%
R140	RF472DJ0	RESISTOR C/F 470R ¼W 5%
R141	RF475DJ0	RESISTOR C/F 470K ¼W 5%
R201	RF822DJ0	RESISTOR C/F 820R ¼W 5%
R202	RF821DJ0	RESISTOR C/F 82R ¼W 5%
R203,402	RF473DJ0	RESISTOR C/F 4K7 ¼W 5%
R204	RF564DJ0	RESISTOR C/F 56K ¼W 5%
R205	RF103DJ0	RESISTOR C/F 1K0 ¼W 5%
R206,401	RF104DJ0	RESISTOR C/F 10K ¼W 5%
R207	RF154DJ0	RESISTOR C/F 15K ¼W 5%
R208	RF334DJ0	RESISTOR C/F 33K ¼W 5%
R209	RF274DJ0	RESISTOR C/F 27K ¼W 5%
R210	RF332DJ0	RESISTOR C/F 330R ¼W 5%
R212,225	RF472DJ0	RESISTOR C/F 470R ¼W 5%
R213,303	RF103DJ0	RESISTOR C/F 1K0 ¼W 5%
R214	RF471GJ0	RESISTOR C/F 47R ½W 5%
R215	RO100JJ0	RESISTOR MET/O 1R0 1W 5%
R216	RF271GJ0	RESISTOR C/F 27R ½W ± 5%
R217	RO470LJ0	RESISTOR MET/O 4R7 2W 5%
R218	RO103LJ0	RESISTOR M.O. 1K 2W ± 5%
R220********** ⚠	RL101GJ0	RESISTOR FUS/F 10R ½W 5%
R221,222	RO100JJ0	RESISTOR MET/O 1R0 1W 5%
R223	RF104DJ0	RESISTOR C/F 10K ¼W 5%
R226	RF393DJ0	RESISTOR C/F 3K9 ¼W 5%
R228	RF824DJ0	RESISTOR C/F 82K ¼W 5%
R301	RF105DJ0	RESISTOR C/F 100K ¼W 5%
R304	RF683DJ0	RESISTOR C/F 6K8 ¼W 5%
R306	RF474DJ0	RESISTOR C/F 47K ¼W 5%
R307	RF274DJ0	RESISTOR C/F 27K ¼W 5%
R308	RF120DJ0	RESISTOR C/F 1R2 ¼W ± 5%
R309	RF473DJ0	RESISTOR C/F 4K7 ¼W 5%
R310	RF332GJ0	RESISTOR C/F 330R ½W ± 5%
R312	RF332GJ0	RESISTOR C/F 330R ½W ± 5%
R313********** ⚠	RL470GJ0	RESISTOR FUS/F 4R7 ½W 5%
R314	RF335DJ0	RESISTOR C/F 330K ¼W 5%
R315	RF824DJ0	RESISTOR C/F 82K ¼W 5%

Circuit Reference	Component Reference	Component Description
RESISTORS (Continued)		
R316	RF562DJ0	RESISTOR C/F 560R ¼W 5%
R317	RF272GJ0	RESISTOR C/F 270R ½W 5%
R318	RM392GJ0	RESISTOR M/F 390R ½W 5%
R403	RF184DJ0	RESISTOR C/F 18K ¼W 5%
R404	RF102DJ0	RESISTOR C/F 100R ¼W 5%
R405	RF100DJ0	RESISTOR C/F 1R0 ¼W 5%
R406	RF104DJ0	RESISTOR C/F 10K ¼W 5%
POTENTIOMETERS		
VR201	RQ104AL2	POT. PRESET 10K 0.1W 20% HZ
VR202	RQ474AL2	POT. PRESET 47K 0.1W 20% HZ
VR301	RQ225AL2	POT. PRESET 220K 0.1W 20% HZ
VR302,303	RQ103AL2	POT. PRESET 1K0 0.1W 20% HZ
VR304	RR103GL2	RESISTOR CERMET 1K0 0.5W 20%
VR401	RQ473AL2	POT. PRESET 4K7 0.1W 20% HZ
VR402	RQ474AL2	POT. PRESET 47K 0.1W 20% HZ
CAPACITORS		
C21,212,310	CM105NK6	CAPACITOR MET/P 100nF 250V 10%
C201	CK122JJ0	CAPACITOR CERAMIC/T 120pF 5%
C202,206,302	CA107JL7	CAP A/ELEC 10µF 50V 20% RAD PR
C203	CA227FM7	CAPACITOR ALUM/E 22µF 25V 50%
C204	CA106JL7	CAPACITOR ALUM/E 1µF 50V
C205	CM155KK6	CAPACITOR MET/P 150nF 100V
C207	CA476JL7	CAPACITOR A/ELEC 4.7µF 50V 20%
C208,213	CA228FM7	CAPACITOR ALUM/E 220µF 25V
C209,214,223	CM474NK6	CAPACITOR MET/P 47nF 250V 10%
C211	CL273MI0	CAPACITOR P/P 2n7 160V 2% AXIAL
C215	CA227NM7	CAPACITOR ALUM/E 22µF 250V 50%
C217	CM104TL6	CAPACITOR MET/P 0.01µF 630V
C218********** ⚠	CL913XJ6	CAPACITOR P/P 9n1 1500V 5%
C219********** ⚠	CL274NJ6	CAPACITOR P/P 27nF 250V DC 5%
C220	CB226KK6	CAPACITOR POLY/C 2µ2 100V 10%
C221********** ⚠	CL685NJ6	CAPACITOR P/P 680nF 250V 5%
C222	CM225KK6	CAPACITOR MET/P 0.22µF 100V
C230,401,402	CK104FL0	CAPACITOR CER/T 10nF 25V 20%
C231 IN PARALLEL WITH R223	CK121JK0	CAPACITOR CERAMIC/T 12pF 50V
C301	CM685KK6	CAPACITOR MET/P 680nF 100V 10%
C303	CK103JK0	CAPACITOR CERAMIC/T 1nF 50V
C304	CK122JJ0	CAPACITOR CERAMIC/T 120pF 5%
C305	CA108HM7	CAPACITOR ALUM/E 100µF 35V 50%
C306	CA109IN7	CAPACITOR ALUM/ELEC 1000µF 40V
C307,403	CK223JK0	CAPACITOR CER/T 2n2 50V 10%
C308	CA229FL7	CAPACITOR A/E 2200µF 25V 20%
C309	CA476JL7	CAPACITOR A/ELEC 4.7µF 20% 50V

Circuit Reference	Component Reference	Component Description
TRANSFORMERS		
T2********** ⚠	TO0677IO1	TRANSFORMER POWER SUPPLY SERIES-5
MISCELLANEOUS		
********** ⚠	BC0237IO6	PCB POWER SUPPLY
PL4	KP0024A10	PLUG 10 WAY 5 PIN 20/3450/BCEG1
PL5	KP0025AO5	PLUG 5 WAY 20/3445/BD
PL1 DEGAUSS COIL	KP0320DO3	PLUG 3 PIN 320/3763 0.3" + 0.2"
PL3 MAINS LEAD	KP0300DO5	PLUG 5 WAY 320/3765-2-4 PINS
F1,2********** ⚠	KA2001BA0	FUSE 2 AMP 20mm ANTISURGE
F1,2	KS0005YO1	FUSEHOLDER PTF/15

SERIES-5 - TUBE BASE PCB ASSEMBLY

Circuit Reference		Component Reference	Component Description
RESISTORS			
R901		CK103JK0	CAPACITOR CERAMIC/T 1nF 50V
R902,908,913,915,920		RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R904,912,918		RO154LJ0	RESISTOR MET. OXIDE 15K 2W 5%
R905 AS PER SAMPLE		RF223DJ0	RESISTOR C/F 2K2 ¼W 5%
R907,922,936**********	⚠	RL102DJ0	RESISTOR M/FUS 100R ¼W 5%
R911,917,935		RF474JJ0	RESISTOR C/F 47K 1W 5%
R923		RF472DJ0	RESISTOR C/F 470R ¼W 5%
R924,925,926		RK222GK0	RESISTOR C.COMP. 220R ½W
R927		RK105GK0	RESISTOR C/C 100K ½W 10%
R931		RK103GK0	RESISTOR C/C 1K0 ½W 10%
VR902,910,916		RQ103AL2	POT. PRESET 1K0 0.1W 20% HZ
VR906,914,921		RQ473AL2	POT. PRESET 4K7 0.1W 20% HZ
CAPACITORS			
C901		CM105NK6	CAPACITOR MET/P 100nF 250V 10%
C902		CK331JJ0	CAPACITOR CERAMIC/T 33pF 50V
C903,907		CK122JJ0	CAPACITOR CERAMIC/T 120pF 5%
C904,906		CK271JJ0	CAPACITOR CERAMIC/T 27pF 50V
C905		CK681JJ0	CAPACITOR CERAMIC/T 68pF 50V
C910,911		CD104YL7	CAPACITOR CER. 10nF 2KV 20%
DIODES			
D901-906,908		DS4148UT0	DIODE IN4148
D907		DZ79560FB0	DIODE ZENER BZX79B5V6 2%
TRANSISTORS			
TR901,903,905		QS0042UM0	TRANSISTOR MPSA42
TR902,904,906		QS0869UA0	TRANSISTOR BF869
TR907		QS4123UM0	TRANSISTOR 2N4123 MOTOROLA
CHOKES			
L902,924-926		LW154SK2	CHOKE 15µH B78108-T1153-K
MISCELLANEOUS			
**********	⚠	KS0004YI0	SOCKET - TUBEBASE 20/4569
**********	⚠	BC0318I03	PCB TUBEBASE
LK902 FITTED AS SAMPLE		WL2214TU1	WIRE LINK 5mm x 14mm x 5mm

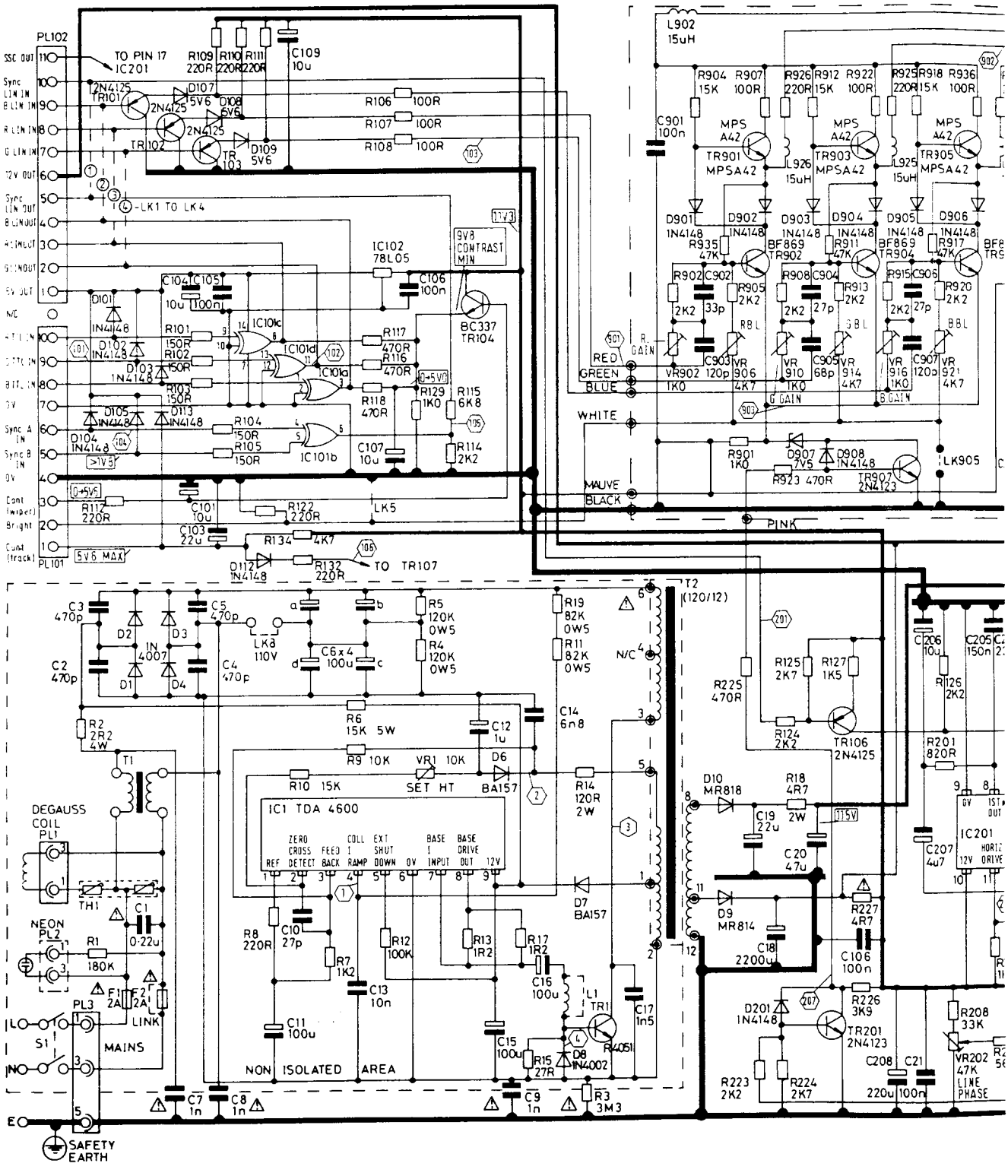
Circuit Reference	Component Reference	Component Description
DIODES		
D111	DZ79560FB0	DIODE ZENER BZX79B5V6 2%
D201,210,401	DS4148UT0	DIODE IN4148
D202	DF0157UE0	DIODE BA157
D203	DF0448UP0	DIODE BY448 MULLARD
D204	DF0096DP0	DIODE BYV96D
D301	DP4002UM0	DIODE IN4002
D302	DF0159UF0	DIODE BA159 EASBY
TRANSISTORS		
TR105	QS0337UT0	TRANSISTOR BC337-RL1
TR106,107	QS4125UM5	TRANSISTOR 2N4125 MOTOROLA
TR201	QS4123UM0	TRANSISTOR 2N4123 MOTOROLA
TR202A,202B	QS0337UT0	TRANSISTOR BC337-RL1
INTEGRATED CIRCUITS		
IC201	IL2578AP2	CIRCUIT INT. TDA2578A
IC401	IL4950US2	CIRCUIT INT. TDA4950
CHOKES		
L201	LO0368I01	CHOKE 9mH AXIAL LINE MODULATOR
L202	LO0367I01	CHOKE - 600uH AXIAL LINE MULTILAYER
L203	LN002UA5	COIL LINEARITY
L401	LW154SK2	CHOKE 15uH B78108-T1153-K
MISCELLANEOUS		
T201	TL002DU0	TRANSFORMER LINE OPT DRIVER
PL201	KP0320D05	PLUG 5 PIN 320/3765/-3
	AO1700I01	HEATSINK ASSY LOPT 1246/FA1
	AO2856I01	EHT CAPACITOR BKT. SUB ASSY-S.5
	AO1789I01	LEAD ASSY-DRIVE-I/FACE LEAD E
	AO1698I01	PSU HARNESS NO. 2 SERIES-5
	WA0021A03	TUBE BASE HARNESS NO. 1
	AO1790I01	LEAD ASSY-I/FACE TO TUBE BASE

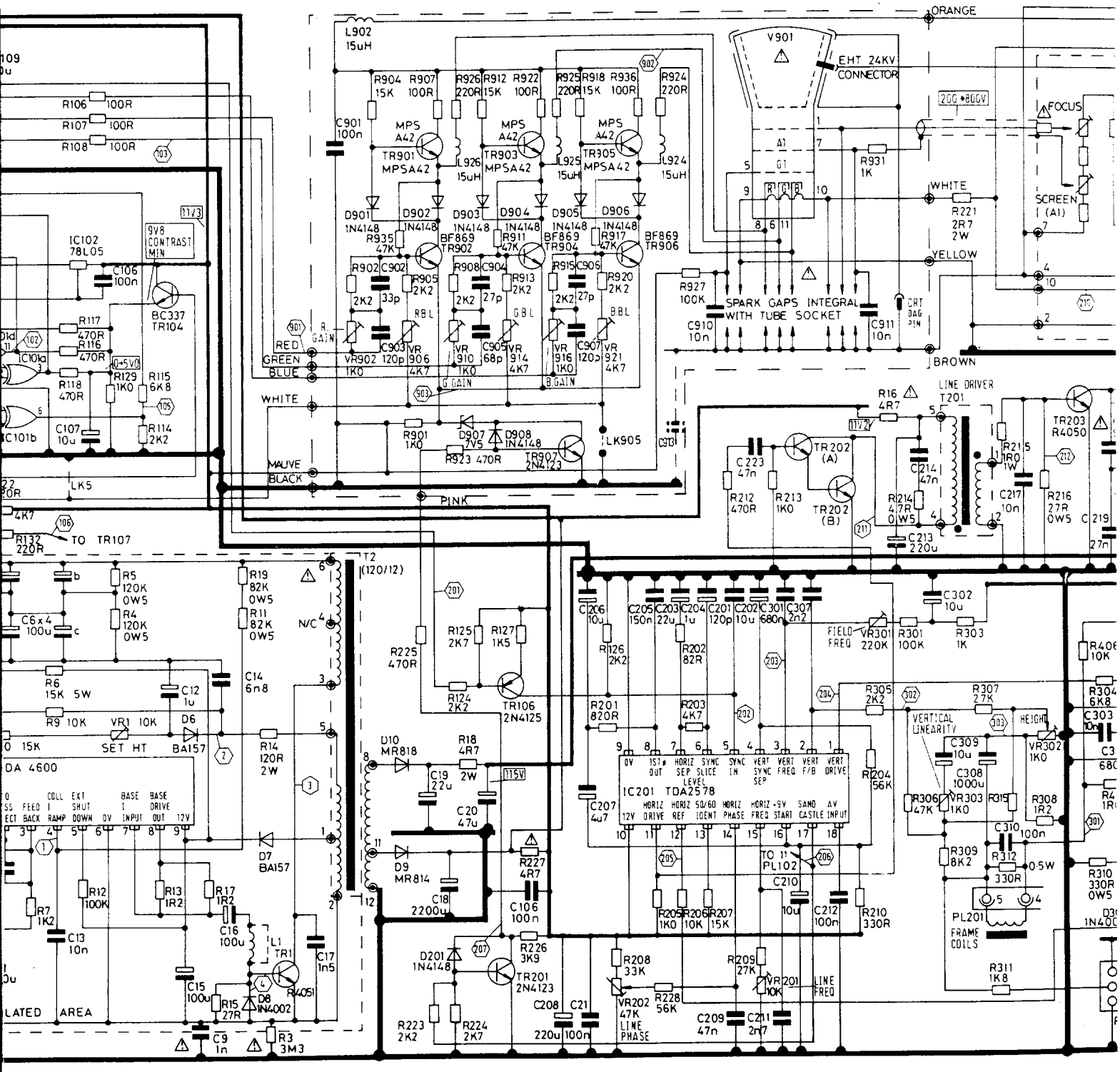
SERIES-5 - HEAT SINK ASSEMBLY (SMPSU)

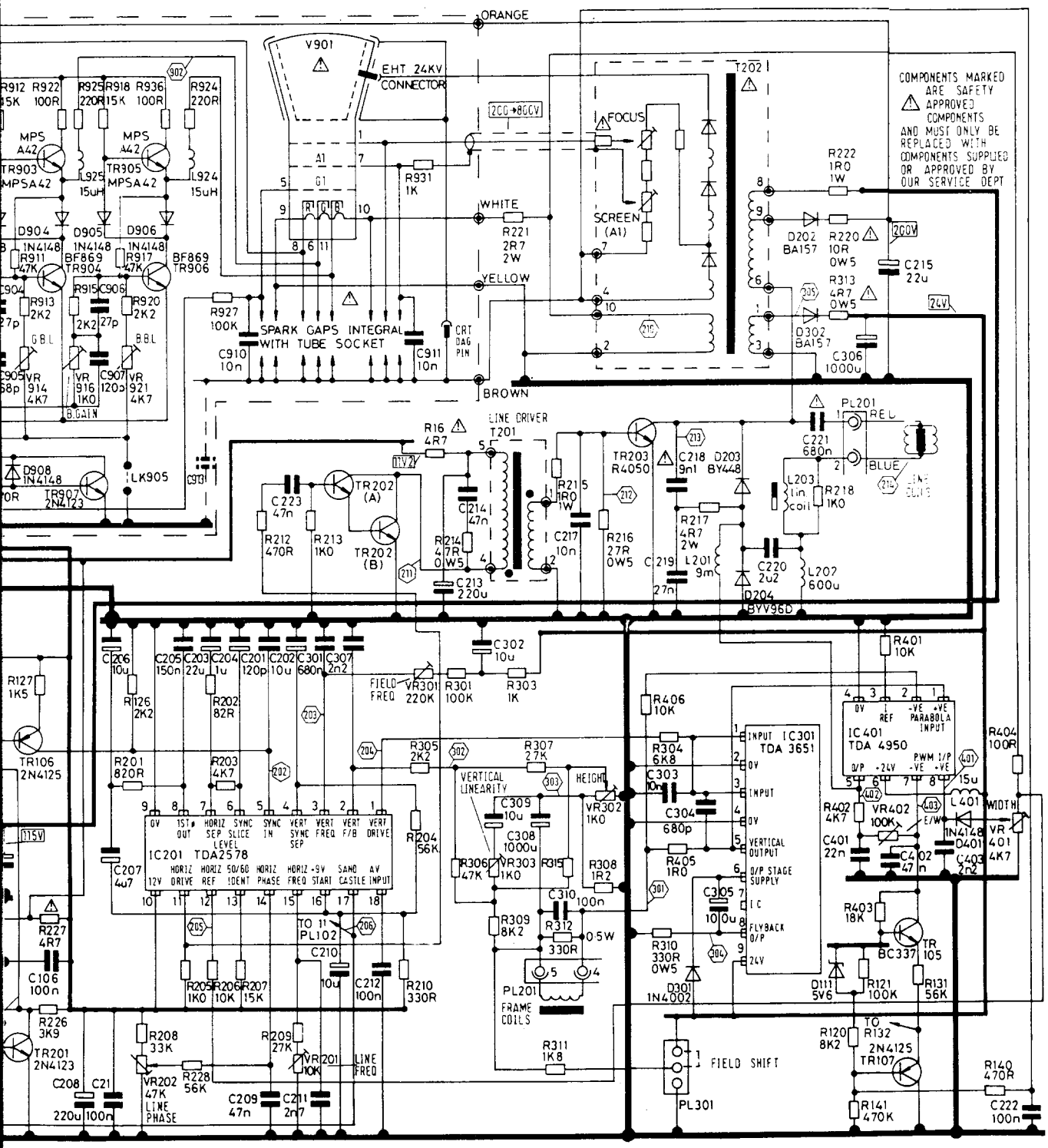
Circuit Reference	Component Reference	Component Description
TRANSISTOR		
TR1	QQ4051UX0	TRANSISTOR R4051 TYPE N UNPREF
INTEGRATED CIRCUIT		
IC1	IW4600UV4	CIRCUIT INT. TDA4600 SMPPS CON
	MO0391I03	BKT.HEATSINK - POWER SUPPLY
	HC0005AB0	CLIP-POWER TRANSISTOR MOUNTING

SERIES-5 - HEAT SINK ASSEMBLY (LOPT)

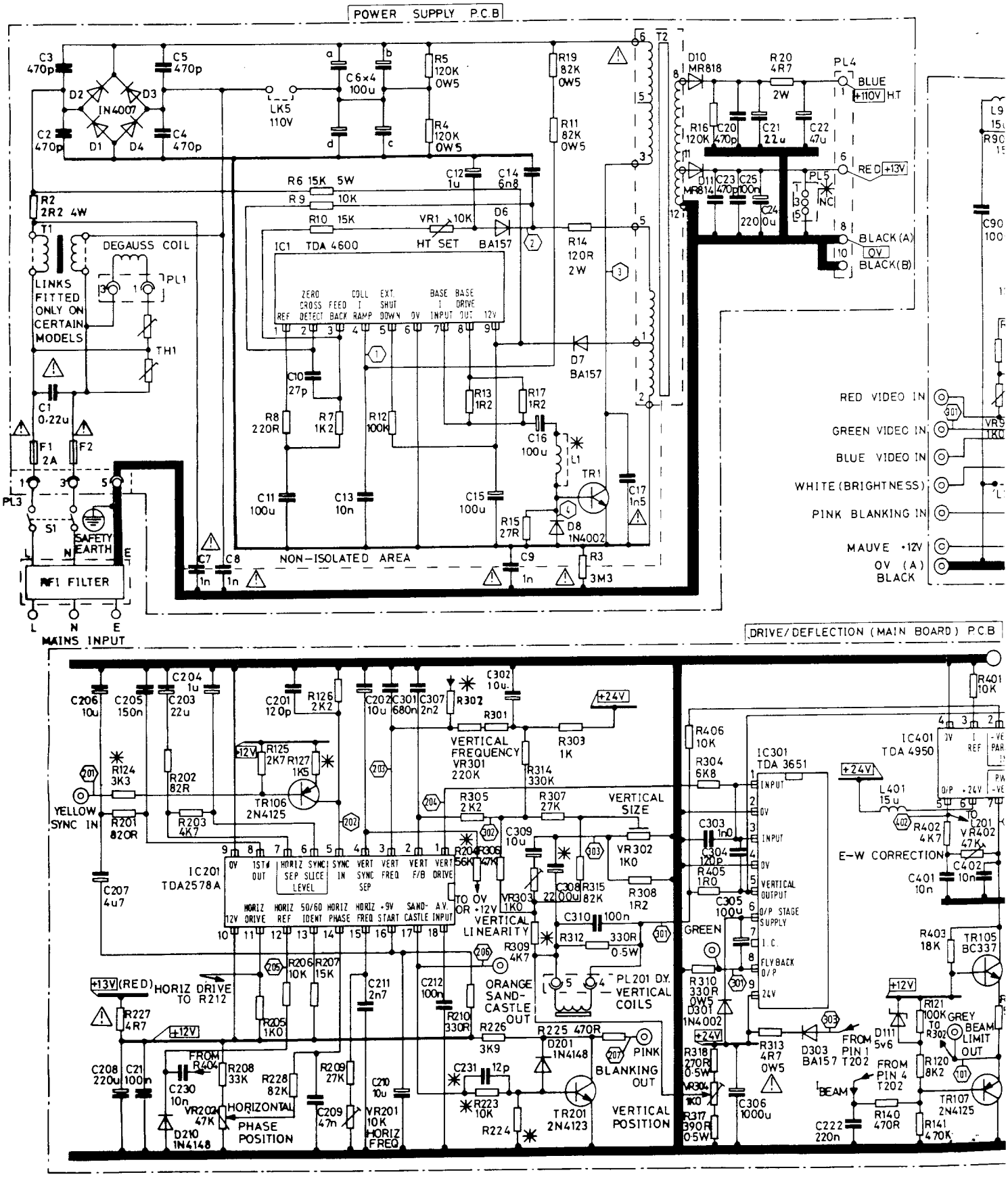
Circuit Reference	Component Reference	Component Description
TRANSISTOR		
TR203	QQ4050UX0	TRANSISTOR R4050 TYPE N UNPREF
INTEGRATED CIRCUIT		
IC301	IL3651UP2	CIRCUIT INT. TDA3651
	MO0392I05	BKT. HEATSINK
	HC0005AB0	CLIP-POWER TRANSISTOR MOUNTING

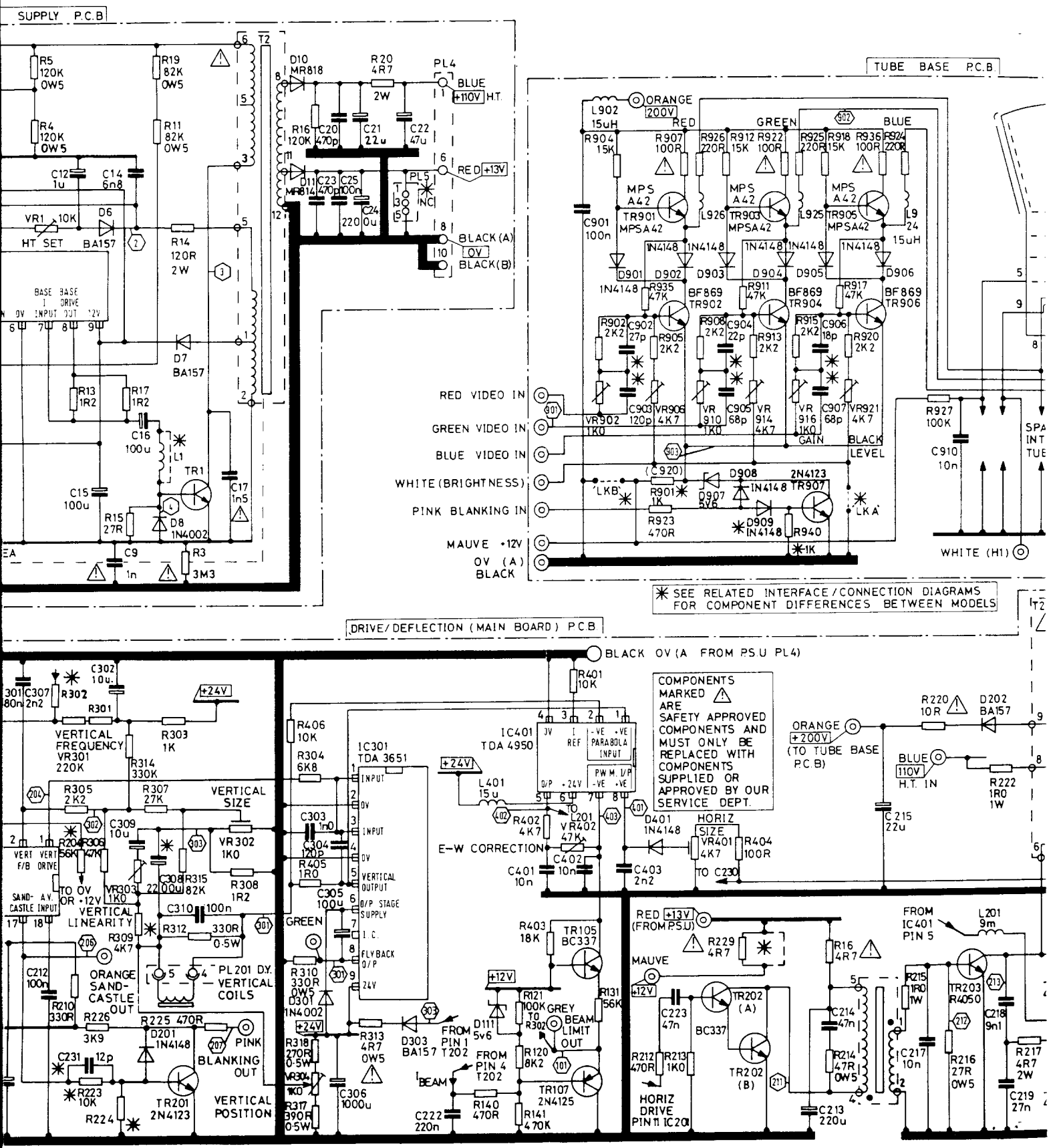

PL102
TO PIN 17 IC201
R109 220R R110 220R R111 220R
C109 10u
2N4125 TR101
2N4125
2N4125 TR102
TR 103
D107 15V6
D108 6V6
D109 5V6
R106 100R
R107 100R
R108 100R
-LK1 TO LK4
IC102 78L05
C106 100n
9V8 CONTRAST MIN
BC337 TR104
C104 10u
C105 100n
D101 IN4148
R101 150R
R102 150R
R103 150R
D102 IN4148
D103 1N4148
D105 IN4148
D113 IN4148
D104 IN4148
IC101c
IC101d
IC101a
IC101b
R104 150R
R105 150R
R117 470R
R116 470R
R118 470R
R129 1K0
R115 6K8
R114 2K2
C107 10u
C101 10u
C103 22u
R112 220R
R122 220R
LK5
R134 4K7
D112 IN4148
R132 220R
TO TR107
PL101
5V6 MAX
L902 15uH
R904 15K
R907 100R
R926 220R
R912 15K
R922 100R
R925 220R
R918 15K
R936 100R
C901 100n
MPS A42
TR901 MPSA42
TR903 MPSA42
TR905 MPSA42
L926 15uH
L925 15uH
D901 1N4148
D902 1N4148
D903 1N4148
D904 1N4148
D905 1N4148
D906 1N4148
R935 47K
R911 47K
R917 47K
BF869 TR902
BF869 TR904
R902 2K2
C902 33p
R905 2K2
R908 2K2
C904 27p
R913 2K2
R915 2K2
C906 27p
R920 2K2
RBL
GBL
BBL
VR902 1K0
C903 120p
VR 906 4K7
VR 910 1K0
C905 68p
VR 914 4K7
VR 916 1K0
C907 120p
VR 921 4K7
R. GAIN
G GAIN
B GAIN
RED
GREEN
BLUE
WHITE
MAUVE
BLACK
PINK
R901 1K0
D907 7V5
D908 1N4148
R923 470R
TR907 2N4123
LK905
T2 (120/12)
C3 470p
C2 470p
D2
D3
IN 4007
D1
D4
C5 470p
C4 470p
LK6 110V
C6x4 100u
R5 120K 0W5
R4 120K 0W5
R19 82K 0W5
R11 82K 0W5
N/C
R6 15K 5W
C14 6n8
C12 1u
R9 10K
VR1 10K SET HT
D6 BA157
R10 15K
R14 120R 2W
R2 2R2 4W
T1
DEGAUSS COIL PL1
TH1
C1 0·22u
NEON PL2
R1 180K
F1 2A
F2 2A
PL3
LINK
S1
MAINS
LO
NO
E
SAFETY EARTH
IC1 TDA 4600
ZERO CROSS DETECT
FEED BACK
COLL I RAMP
EXT SHUT DOWN
0V
BASE I INPUT
BASE DRIVE OUT
12V
R8 220R
C10 27p
R7 1K2
R12 100K
R13 1R2
R17 1R2
C16 100u
C13 10n
C11 100u
C15 100u
R15 27R
D8 IN4002
L1
TR1 BU405I
C17 1n5
C7 1n
C8 1n
C9 1n
R3 3M3
NON ISOLATED AREA
R225 470R
R125 2K7
R127 1K5
R124 2K2
TR106 2N4125
R126 2K2
C206 10u
C205 150n
R201 820R
D10 MR818
R18 4R7
C19 22u
C20 47u
D9 MR814
C18 2200u
R227 4R7
C106 100n
D201 1N4148
TR201 2N4123
R226 3K9
R208 33K
VR202 47K LINE PHASE
C208 220u
C21 100n
R223 2K2
R224 2K7
IC201
HORIZ DRIVE
C207 4u7
15V
12V

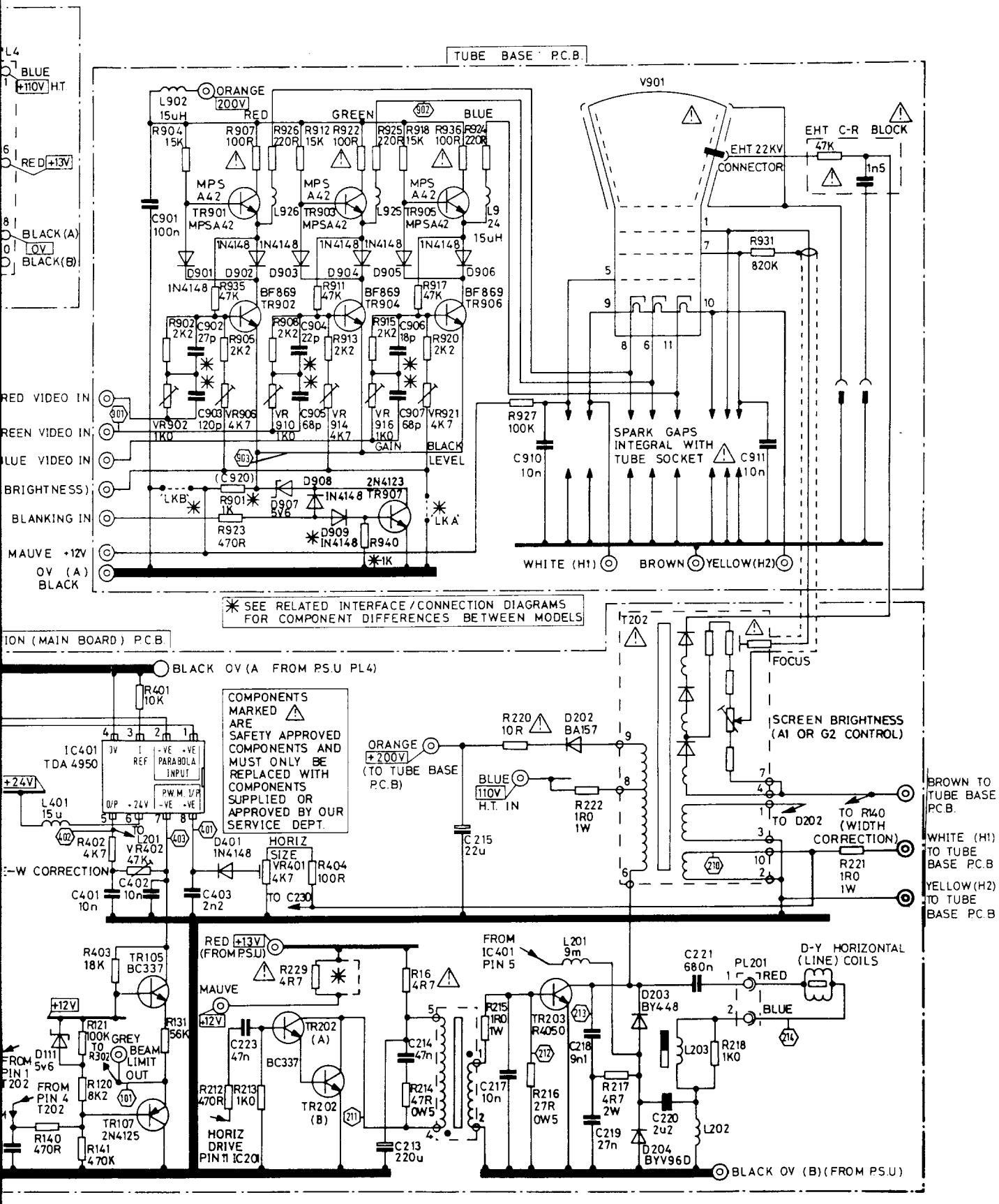

L902
15uH
R904 R907
15K 100R
R926 R912 R922
220R 15K 100R
R925 R918 R936
220R 15K 100R
R924
220R
C901
100n
MPS
A42
TR901
MPSA42
TR903
MPSA42
TR305
MPSA42
L926
15uH
L925
15uH
L924
15uH
D901
1N4148
D902
1N4148
D903
1N4148
D904
1N4148
D905
1N4148
D906
1N4148
R935
47K
R911
47K
R917
47K
BF869
TR902
BF869
TR904
BF869
TR906
R902
2K2
C902
33p
R905
2K2
R908
2K2
C904
27p
R913
2K2
R915
2K2
C905
27p
R920
2K2
RED
GREEN
BLUE
R GAIN
G GAIN
B GAIN
VR902
1K0
C903
120p
VR
906
4K7
VR
910
1K0
C905
68p
VR
914
4K7
VR
916
1K0
C907
120p
VR
921
4K7
WHITE
MAUVE
BLACK
PINK
R901
1K0
D907
ZV5
D908
IN4148
R923 470R
TR907
2N4123
LK905
V901
EHT 24KV
CONNECTOR
ORANGE
200 - 800V
FOCUS
SCREEN
(A1)
R931
1K
WHITE
R221
2R7
2W
YELLOW
BROWN
R927
100K
SPARK GAPS INTEGRAL
WITH TUBE SOCKET
C910
10n
C911
10n
CRT
DAG
PIN
LINE DRIVER
T201
R16
4R7
TR202
(A)
TR202
(B)
C223
47n
R212
470R
R213
1K0
C214
47n
R214
47R
0W5
C213
220u
R215
1R0
1W
C217
10n
TR203
R4050
R216
27R
0W5
C219
27n
IC102
78L05
9V8
CONTRAST
MIN
C106
100n
BC337
TR104
R117
470R
R116
470R
IC101a
R118
470R
R129
1K0
R115
6K8
C107
10u
R114
2K2
IC101b
LK5
R132
220R
TO TR107
T2
(120/12)
R5
120K
0W5
R4
120K
0W5
C6x4
100u
R6
15K 5W
R9 10K
VR1 10K
SET HT
C12
1u
D6
BA157
R19
82K
0W5
R11
82K
0W5
N/C
C14
6n8
R14
120R
2W
D7
BA157
R225
470R
R125
2K7
R127
1K5
R124
2K2
TR106
2N4125
D10
MR818
R18
4R7
2W
C19
22u
C20
47u
D9
MR814
C18
2200u
R227
4R7
C106
100n
R226
3K9
TR201
2N4123
D201
1N4148
R223
2K2
R224
2K7
C208
220u
C21
100n
R208
33K
VR202
47K
LINE
PHASE
R228
56K
R209
27K
VR201
10K
LINE
FREQ
C209
47n
C211
2n7
R311
1K8
C206
10u
C205
150n
C203
22u
C204
1u
C201
120p
C202
10u
C301
680n
C307
2n2
R126
2K2
R202
82R
R201
820R
R203
4K7
IC201 TDA2578
0V
1ST ø OUT
HORIZ SEP
SYNC SLICE LEVEL
SYNC IN
VERT SYNC SEP
VERT FREQ
VERT F/B
VERT DRIVE
12V DRIVE
HORIZ REF
HORIZ 50/60 IDENT
HORIZ PHASE
HORIZ +9V FREQ
SAND START
AV CASTLE
INPUT
C207
4u7
R204
56K
TO 11
PL102
C210
10u
C212
100n
R210
330R
R205
1K0
R206
10K
R207
15K
FIELD
FREQ
VR301
220K
R301
100K
R303
1K
C302
10u
R305
2K2
R307
27K
VERTICAL
LINEARITY
HEIGHT
C309
10u
C308
1000u
VR302
1K0
R306
47K
VR303
1K0
R308
1R2
C310
100n
R309
8K2
R312
330R
0.5W
PL201
FRAME
COILS
R304
6K8
C303
10n
R310
330R
0W5
R406
10K
C302
10u
R12
100K
R13
1R2
R17
1R2
C16
100u
L1
TR1
R4051
C17
1n5
C15
100u
R15
27R
D8
IN4002
C9
1n
R3
3M3
R7
1K2
C13
10n
LATED AREA
DA 4600
SET HT
BA157
MPSA42
BC337
TR104
IN4148
IN4002
R4051
TO TR107
TO 11
PL102
FRAME
COILS
LINE
PHASE
LINE
FREQ
VERTICAL
LINEARITY
HEIGHT
FIELD
FREQ
SET HT
CRT
DAG
PIN
SPARK GAPS INTEGRAL
WITH TUBE SOCKET
LINE DRIVER
T201
EHT 24KV
CONNECTOR
SCREEN
(A1)
FOCUS
ORANGE
WHITE
YELLOW
BROWN
MAUVE
BLACK
PINK
RED
GREEN
BLUE
R GAIN
G GAIN
B GAIN



SERIES 4 MAIN CHASSIS AND TUBEBASE CIRCUIT DIAGRAM


POWER SUPPLY P.C.B
C3 470p
C5 470p
C2 470p
C4 470p
D1
D2
D3
D4
IN4007
LK5 110V
C6x4 100u
R5 120K 0W5
R4 120K 0W5
R19 82K 0W5
R11 82K 0W5
R6 15K 5W
R9 10K
R10 15K
VR1 10K HT SET
D6 BA157
C12 1u
C14 6n8
IC1 TDA 4600
ZERO CROSS DETECT
FEED BACK
COLL I RAMP
EXT SHUT DOWN
0V
BASE I INPUT
BASE DRIVE OUT
12V
R14 120R 2W
D7 BA157
R2 2R2 4W
T1
DEGAUSS COIL
PL1
LINKS FITTED ONLY ON CERTAIN MODELS
TH1
C1 0.22u
F1 2A
F2
PL3
S1
SAFETY EARTH
RF1 FILTER
L
N
E
MAINS INPUT
C10 27p
R8 220R
R7 1K2
R12 100K
R13 1R2
R17 1R2
C16 100u
L1
TR1
C11 100u
C13 10n
C15 100u
R15 27R
D8 1N4002
C17 1n5
C7 1n
C8 1n
NON-ISOLATED AREA
C9 1n
R3 3M3
T2
D10 MR818
R20 4R7 2W
PL4
BLUE +110V H.T
R16 120K
C20 470p
C21 2.2u
C22 47u
D11 MR814
C23 470p
C25 100n
C24 220u
PL5
INC
RED +13V
BLACK (A) 0V
BLACK (B)
RED VIDEO IN
GREEN VIDEO IN
BLUE VIDEO IN
WHITE (BRIGHTNESS)
PINK BLANKING IN
MAUVE +12V
0V (A) BLACK
DRIVE/DEFLECTION (MAIN BOARD) P.C.B
C206 10u
C205 150n
C204 1u
C203 22u
C201 120p
R126 2K2
C202 10u
C301 680n
C307 2n2
C302 10u.
R302
R301
+24V
VERTICAL FREQUENCY VR301 220K
R303 1K
R314 330K
+12V
R125 2K7
R127 1K5
TR106 2N4125
R124 3K3
R202 82R
R201 820R
R203 4K7
YELLOW SYNC IN
R305 2K2
R307 27K
VERTICAL SIZE
VR302 1K0
C309 10u
R204 56K
R306 47K
C308 22.00u
R315 82K
R308 1R2
VR303 1K0
TO 0V OR +12V
VERTICAL LINEARITY
C310 100n
R312 330R 0.5W
PL201 D.Y. VERTICAL COILS
IC201 TDA2578A
0V
1ST # OUT
HORIZ SEP SYNC SLICE LEVEL
SYNC IN
VERT SYNC SEP
VERT FREQ
VERT F/B
VERT DRIVE
HORIZ 12V DRIVE
HORIZ REF
50/60 IDENT
HORIZ PHASE
HORIZ FREQ
+9V START
SAND-CASTLE
A.V. INPUT
C207 4u7
R206 10K
R207 15K
R205 1K0
+13V (RED)
HORIZ DRIVE TO R212
R227 4R7
C211 2n7
C212 100n
ORANGE SAND-CASTLE OUT
R210 330R
R226 3K9
R225 470R
D201 1N4148
PINK BLANKING OUT
C231 12p
R223 10K
R224
TR201 2N4123
VERTICAL POSITION
C208 220u
C21 100n
FROM R404
C230 10n
R208 33K
R228 82K
R209 27K
C210 10u
VR202 47K
HORIZONTAL PHASE POSITION
C209 47n
VR201 10K HORIZ FREQ
D210 1N4148
IC301 TDA 3651
INPUT
0V
INPUT
0V
VERTICAL OUTPUT
O/P STAGE SUPPLY
I.C.
FLYBACK O/P
24V
R406 10K
R304 6K8
C303 1n0
C304 120P
R405 1R0
C305 100u
GREEN
R310 330R 0W5
D301 1N4002
R318 270R 0.5W
VR304 1K0
R317 390R 0.5W
C306 1000u
R313 4R7 0W5
D303 BA157
FROM PIN 1 T202
BEAM
FROM PIN 4 T202
C222 220n
R140 470R
IC401 TDA 4950
L401 15u
R402 4K7
VR402 47K
E-W CORRECTION
C402 10n
C401 10n
R403 18K
TR105 BC337
R121 100K
GREY BEAM LIMIT OUT
R120 8K2
TR107 2N4125
R141 470K
R401 10K

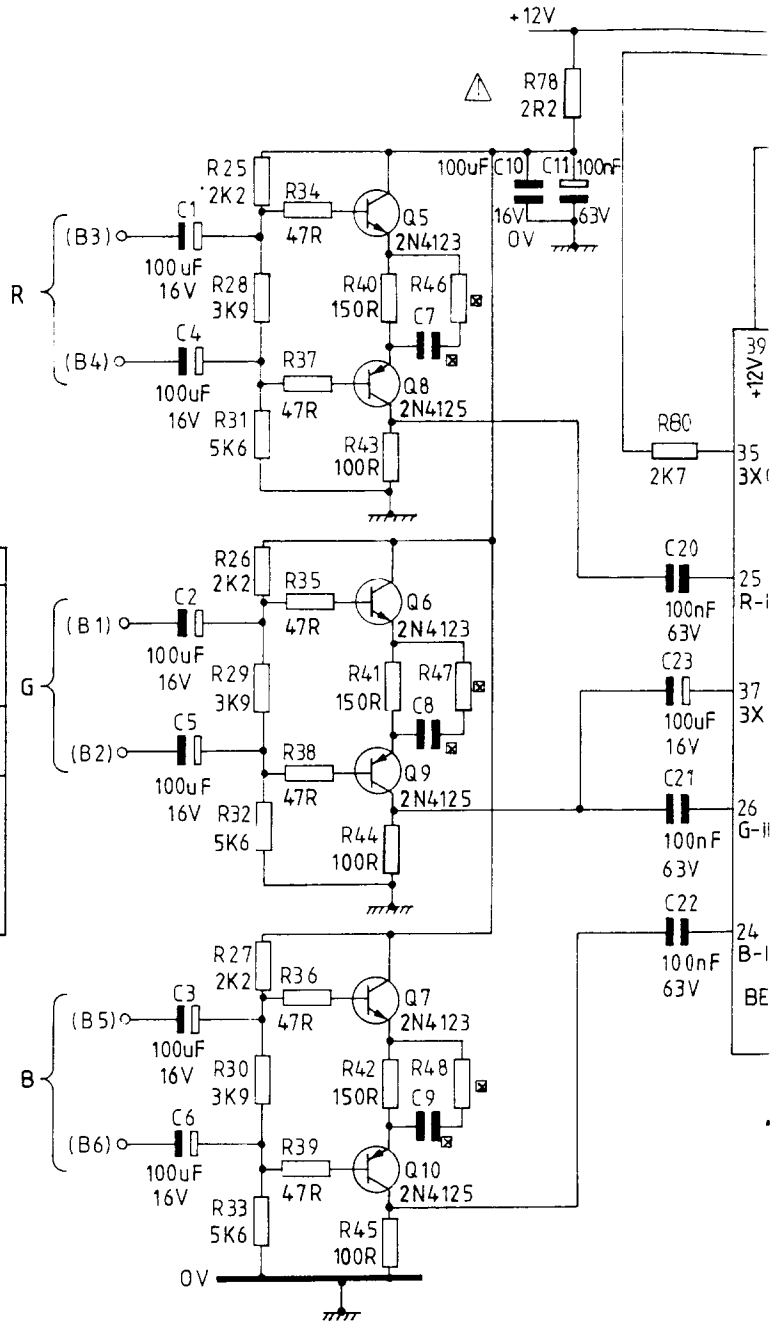

SUPPLY P.C.B
TUBE BASE P.C.B
DRIVE/DEFLECTION (MAIN BOARD) P.C.B
HT SET
RED VIDEO IN
GREEN VIDEO IN
BLUE VIDEO IN
WHITE (BRIGHTNESS)
PINK BLANKING IN
MAUVE +12V
OV (A) BLACK
WHITE (H1)
BLACK OV (A FROM PSU PL4)
COMPONENTS MARKED ⚠ ARE SAFETY APPROVED COMPONENTS AND MUST ONLY BE REPLACED WITH COMPONENTS SUPPLIED OR APPROVED BY OUR SERVICE DEPT.
✳ SEE RELATED INTERFACE/CONNECTION DIAGRAMS FOR COMPONENT DIFFERENCES BETWEEN MODELS
VERTICAL FREQUENCY VR301 220K
VERTICAL SIZE
VERTICAL LINEARITY
ORANGE SAND-CASTLE OUT
PL201 D.Y. VERTICAL COILS
PINK BLANKING OUT
VERTICAL POSITION
E-W CORRECTION
HORIZ SIZE
HORIZ DRIVE PIN 11 IC201
BEAM LIMIT OUT
IC301 TDA 3651
IC401 TDA 4950
TR1
TR105 BC337
TR107 2N4125
TR201 2N4123
TR202 (A)
TR202 (B)
TR203 R4050
TR901 MPSA42
TR902 BF869
TR903 MPSA42
TR904 BF869
TR905 MPSA42
TR906 BF869
TR907 2N4123
SERIES 5 MAIN

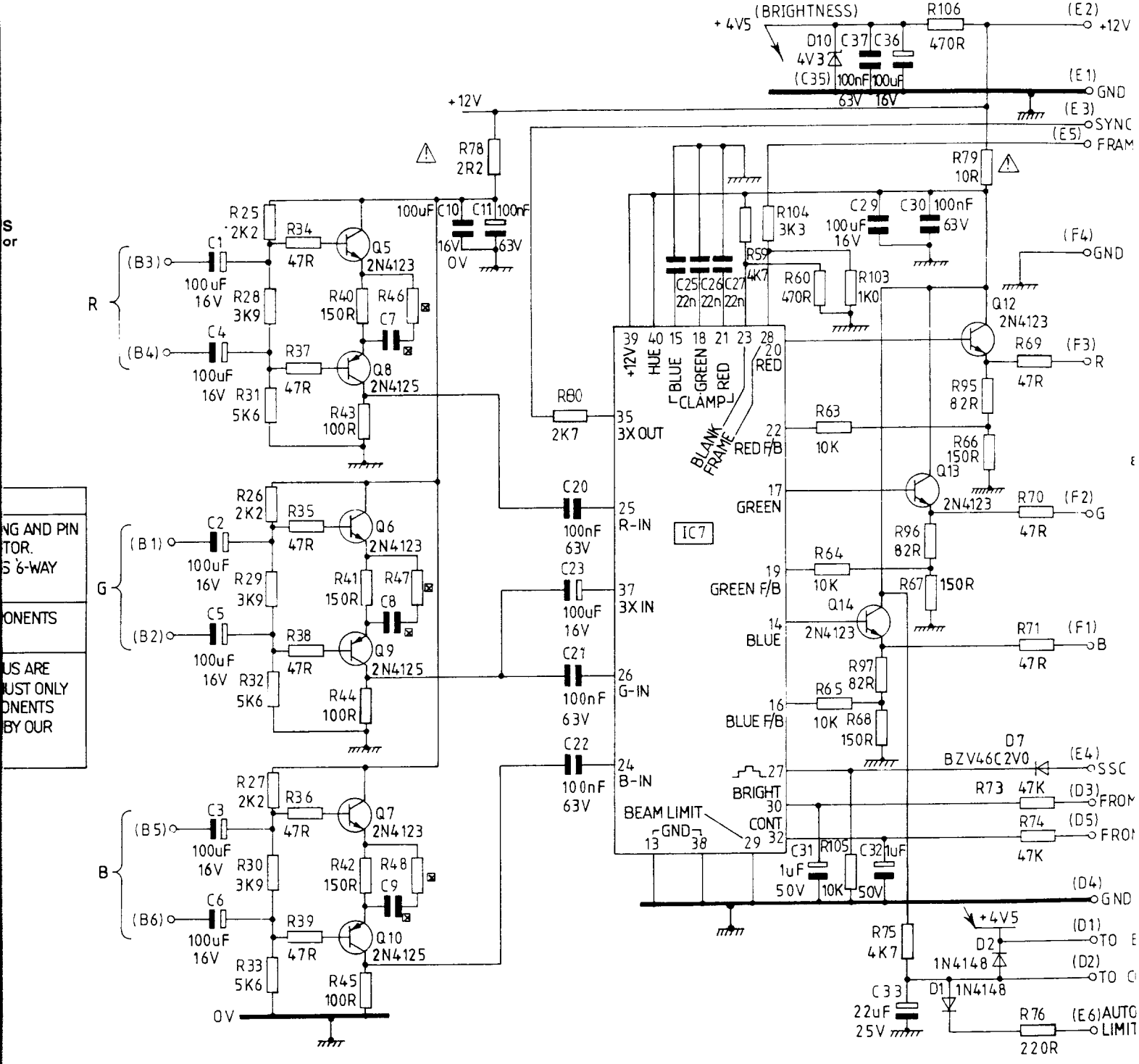


SERIES 5 MAIN CIRCUIT DIAGRAM

For Service Manuals
contact
MAURITRON SERVICES
8 Cherry Tree Road, Chinnor
Oxfordshire, OX9 4QY.
Tel (01844) 351694
Fax (01844) 352554

SYMBOL	NOTES
(B1)	DENOTES TYPICAL MARKING AND PIN NUMBER OF P.C.B. CONNECTOR. I.E. (B1 TO B6) REPRESENTS '6-WAY CONNECTOR.'
☒	DENOTES OPTIONAL COMPONENTS (DEPENDS ON MODEL).
⚠	COMPONENTS MARKED THUS ARE SAFETY APPROVED AND MUST ONLY BE REPLACED WITH COMPONENTS SUPPLIED OR APPROVED BY OUR SERVICE DEPARTMENT.

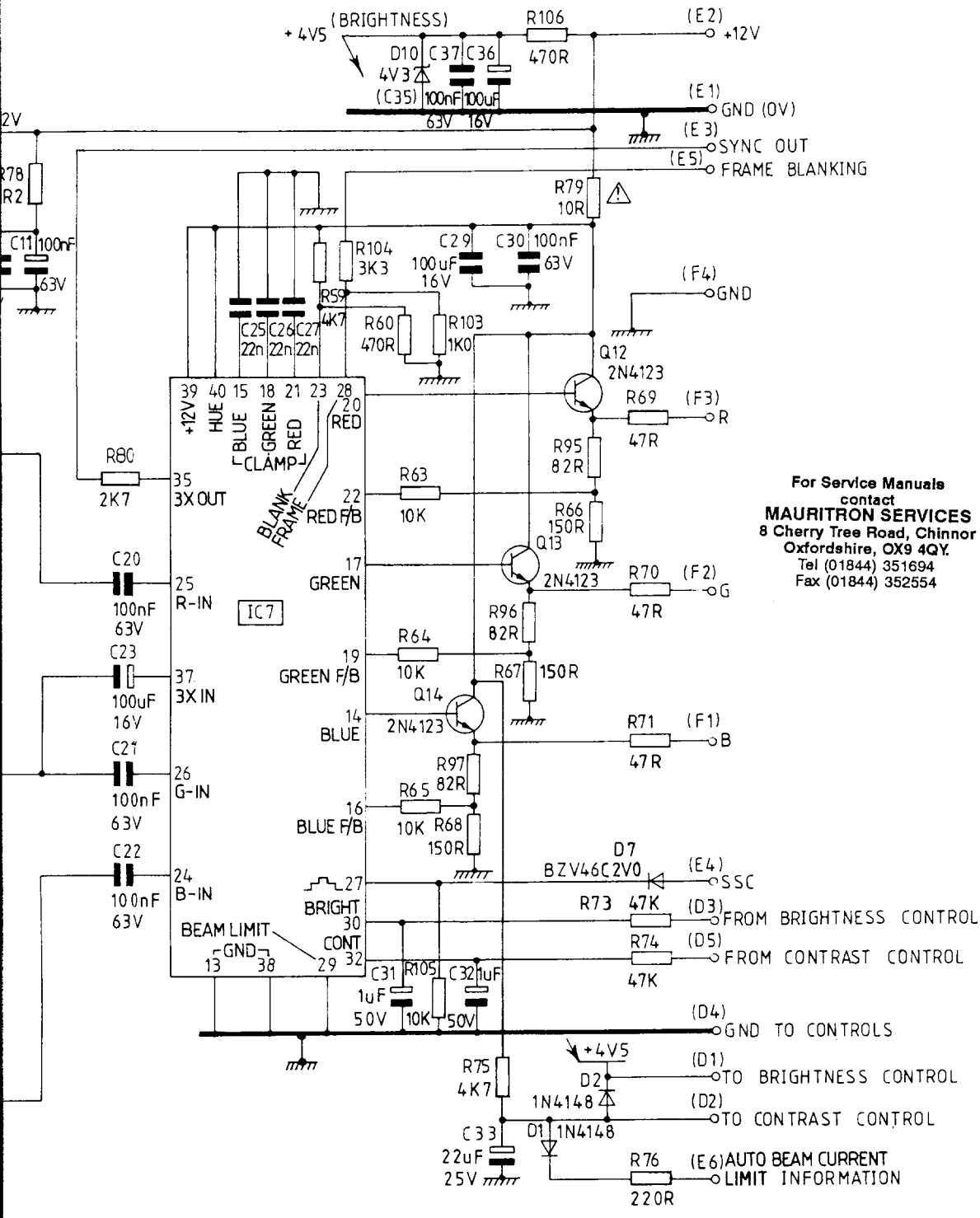




NG AND PIN
TOR.
S 6-WAY

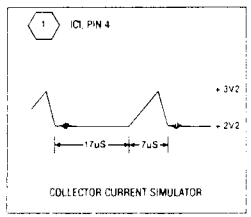
ONENTS

US ARE
UST ONLY
ONENTS
BY OUR

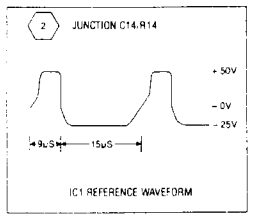


For Service Manuals contact
MAURITRON SERVICES
8 Cherry Tree Road, Chinnor
Oxfordshire, OX9 4QY.
Tel (01844) 351694
Fax (01844) 352554

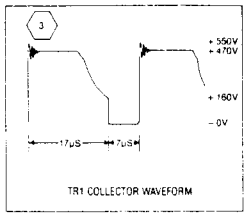
SERIES 5 ANALOGUE INTERFACE CIRCUIT DIAGRAM



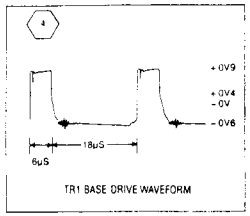
COLLECTOR CURRENT SIMULATOR



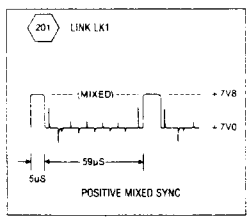
IC1 REFERENCE WAVEFORM



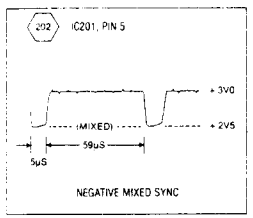
TR1 COLLECTOR WAVEFORM



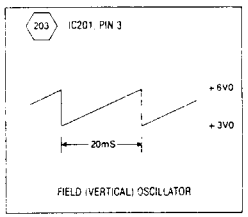
TR1 BASE DRIVE WAVEFORM



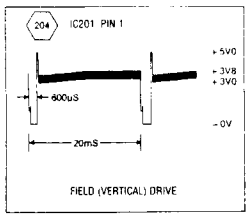
POSITIVE MIXED SYNC



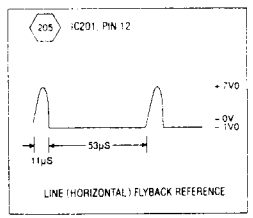
NEGATIVE MIXED SYNC



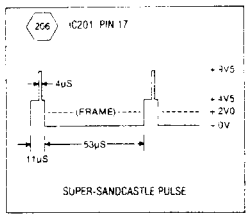
FIELD (VERTICAL) OSCILLATOR



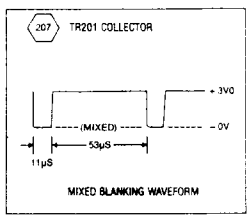
FIELD (VERTICAL) DRIVE



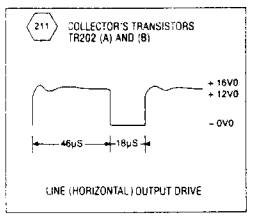
LINE (HORIZONTAL) FLYBACK REFERENCE



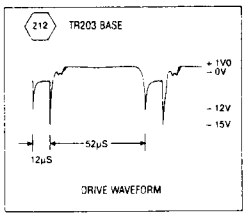
SUPER-SANDCASTLE PULSE



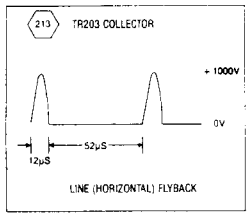
MIXED BLANKING WAVEFORM



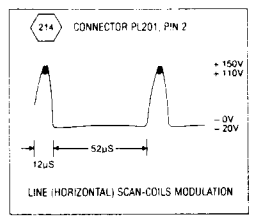
LINE (HORIZONTAL) OUTPUT DRIVE



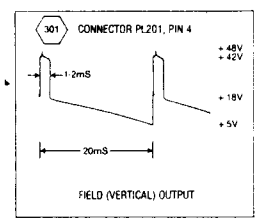
DRIVE WAVEFORM



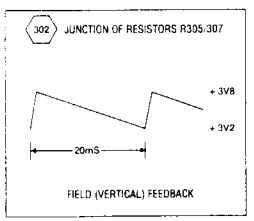
LINE (HORIZONTAL) FLYBACK



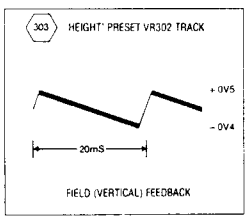
LINE (HORIZONTAL) SCAN-COILS MODULATION



FIELD (VERTICAL) OUTPUT



FIELD (VERTICAL) FEEDBACK



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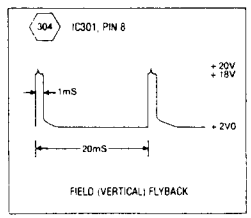
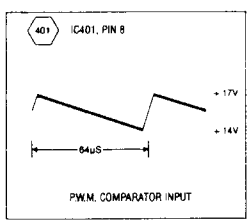
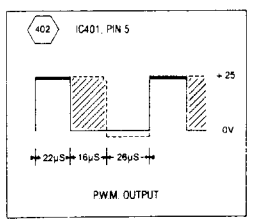


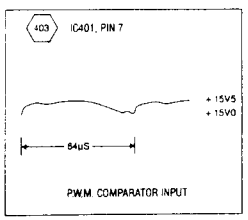
FIELD (VERTICAL) FLYBACK



PWM. COMPARATOR INPUT



PWM. OUTPUT



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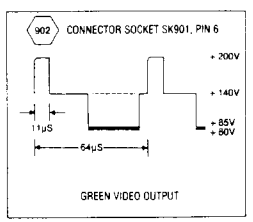
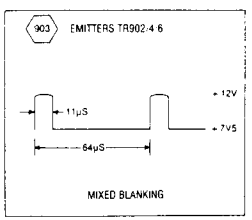


GREEN VIDEO OUTPUT



MIXED BLANKING

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MAURITRON SERVICES
8 Cherry Tree Road, Chinnor
Oxfordshire, OX9 4QY.
Tel (01844) 351694
Fax (01844) 352554

SAFETY AND ISOLATION!

The power supply is always live regardless of the mains supply polarity. Therefore for servicing, the monitor should be supplied through a mains Isolation Transformer of at least 300VA rating.
(See 'SAFETY NOTES' in SERIES 4/5 SERVICE MANUAL).

SAFETY CRITICAL COMPONENTS

Components marked ⚠ on the circuit diagram and parts list are safety approved types and should only be replaced with components supplied or approved by our Service Department. It is recommended that other replaced parts should be of the type originally fitted, particularly resistors stood off the printed circuit boards.
FAILURE TO OBSERVE THE ABOVE MAY RENDER THE CHASSIS AND EXTERNAL ACCESSIBLE PARTS LIVE, OR CAUSE OTHER HAZARDS!

INITIAL TEST CONDITIONS

Mains Input: 240 V A.C. ~ 50 Hz.
Contrast Control: Set to Maximum.
Brightness Control (if fitted): Set to Mid-Range.

WAVEFORM MEASUREMENT POINTS

Waveform points are denoted thus (3)

1) The numerical reference point on the circuit diagram relates to the corresponding numbered display on the accompanying table.
2) Waveform measurements were made using an oscilloscope of 20MHz minimum bandwidth and a ÷ 10 or ÷ 100 passive probe.
3) NOTE DANGER! For reasons of safety, waveforms (1), (2) and (3) MUST be measured ONLY when using a mains Isolation Transformer.

TYPICAL VOLTAGES - MEASUREMENT POINTS

1) Voltages denoted thus 3.0 V. on the circuit diagram, are typical voltages only, and were measured using a high input impedance D.V.M.
2) Alternatively, Analogue meters of 20 KΩ/Volt minimum can be used.

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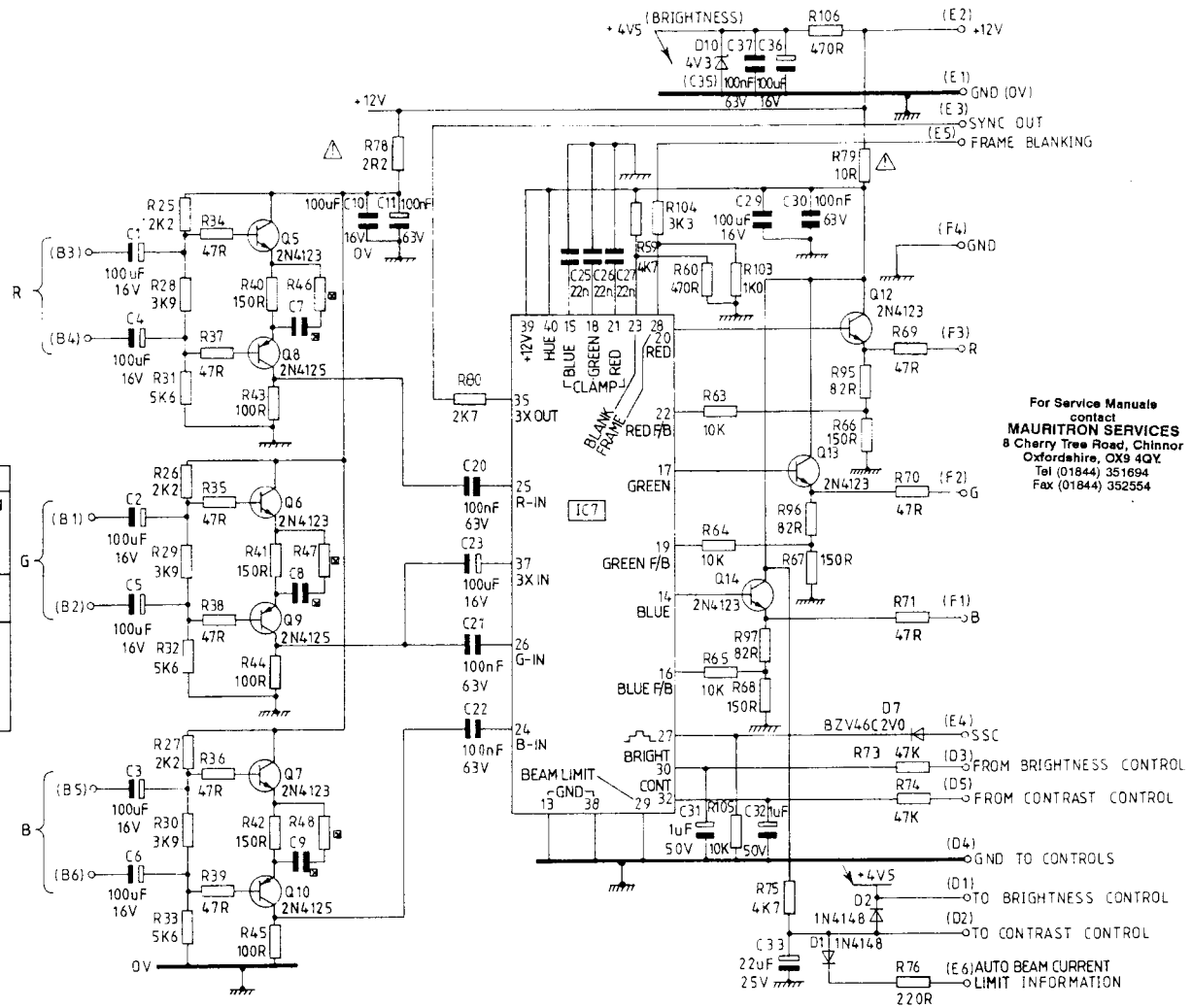
SYMBOL	NOTES
(B1)	DENOTES TYPICAL MARKING AND PIN NUMBER OF PC B CONNECTOR. I.E. (B1 TO B6) REPRESENTS '6-WAY CONNECTOR.'
☒	DENOTES OPTIONAL COMPONENTS (DEPENDS ON MODEL).
⚠	COMPONENTS MARKED THUS ARE SAFETY APPROVED AND MUST ONLY BE REPLACED WITH COMPONENTS SUPPLIED OR APPROVED BY OUR SERVICE DEPARTMENT.



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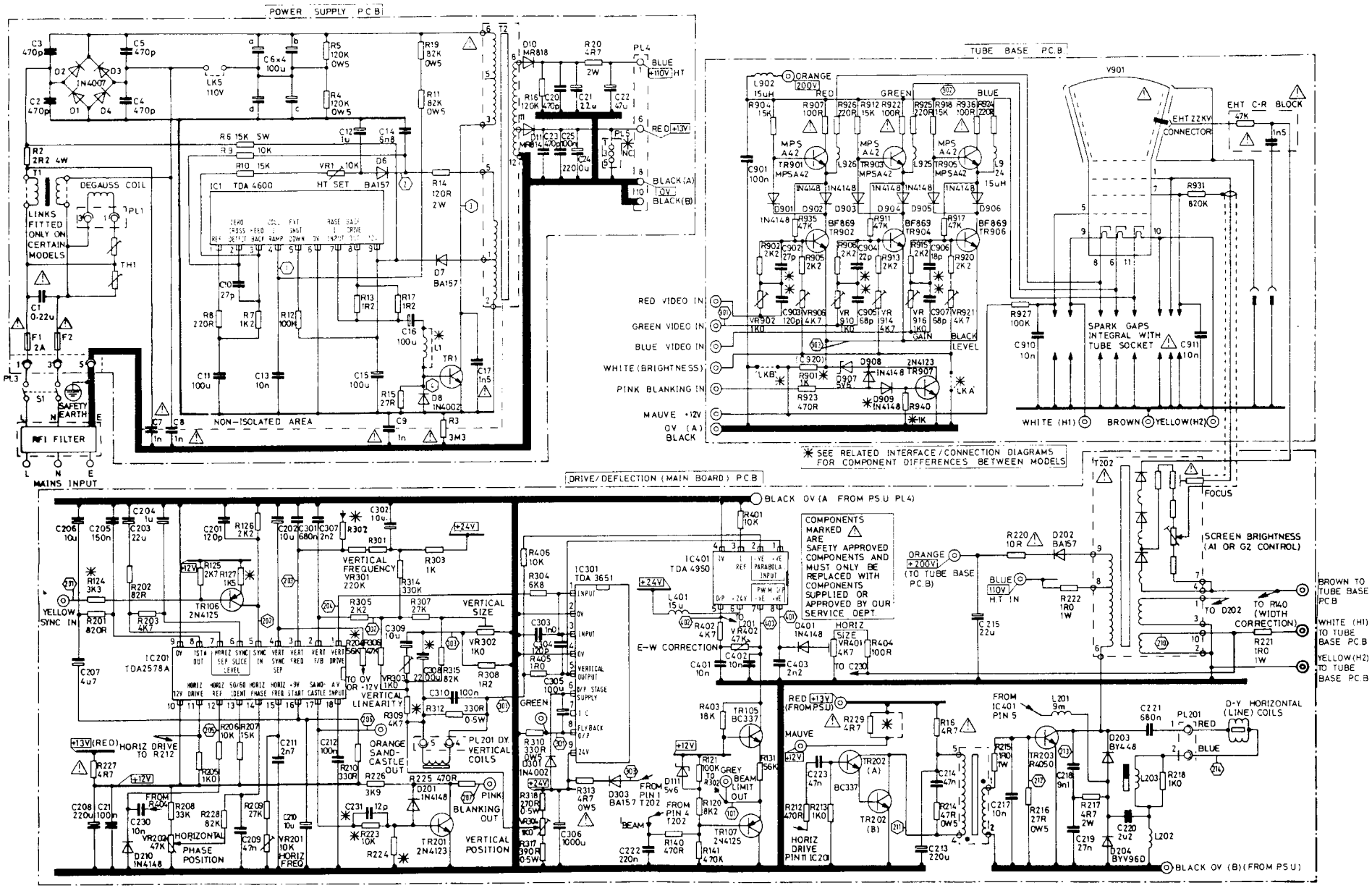
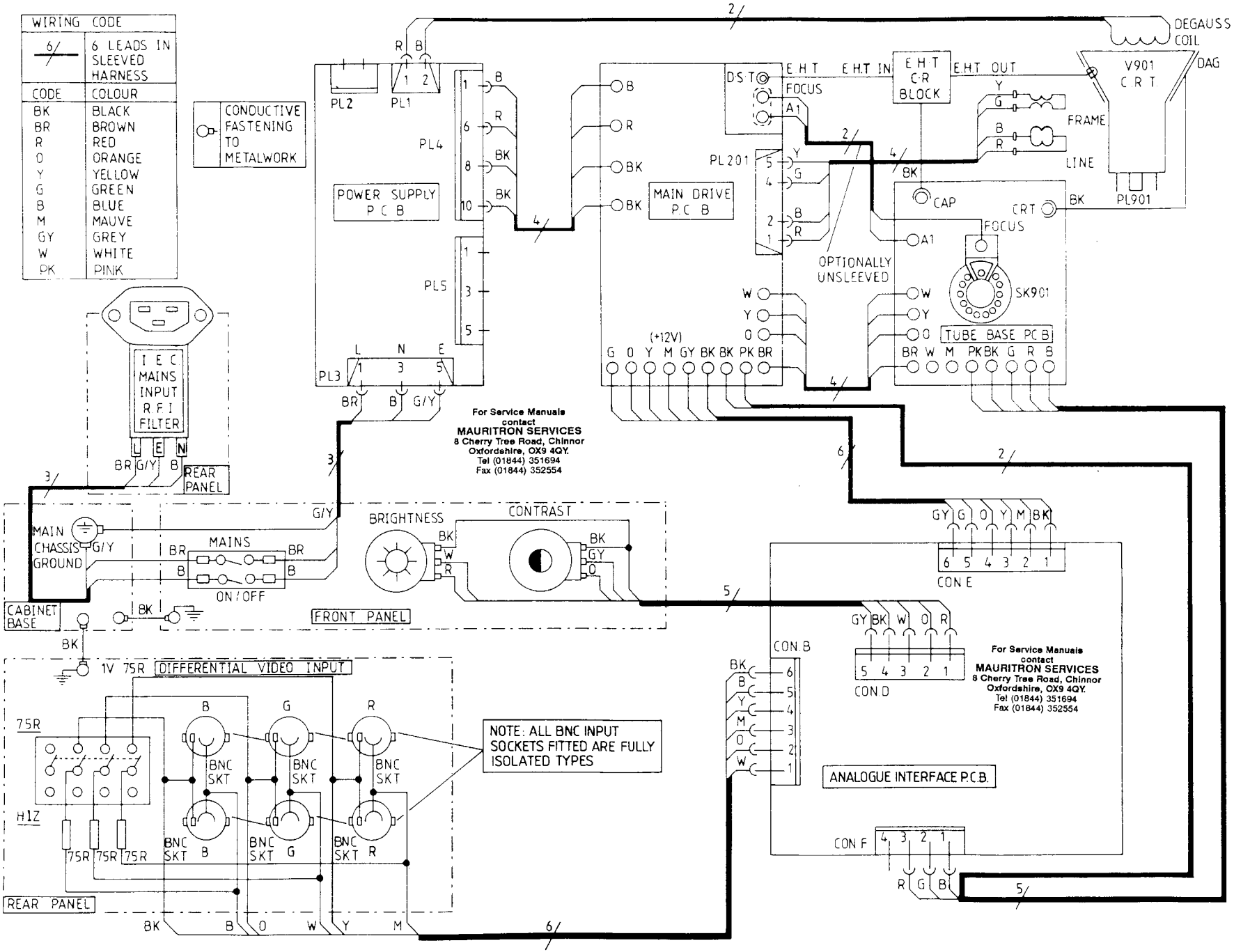
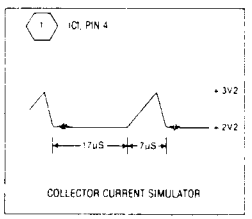
SERIES 5 ANALOGUE INTERFACE CIRCUIT DIAGRAM



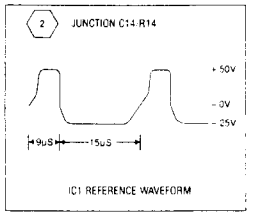
SERIES 5 MAIN CIRCUIT DIAGRAM



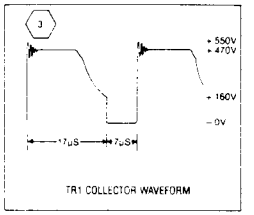
SERIES 5 INTERCONNECTION DIAGRAM (ANALOGUE MONITOR)



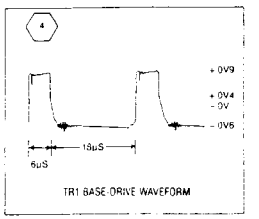
COLLECTOR CURRENT SIMULATOR



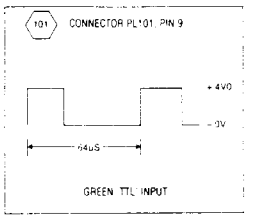
IC1 REFERENCE WAVEFORM



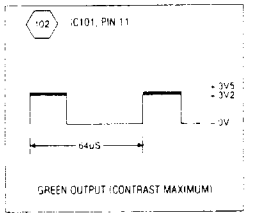
TR1 COLLECTOR WAVEFORM



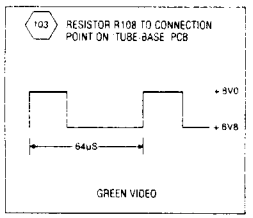
TR1 BASE-DRIVE WAVEFORM



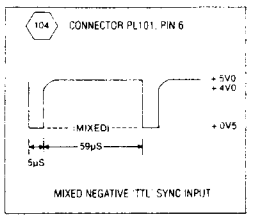
GREEN TTL INPUT



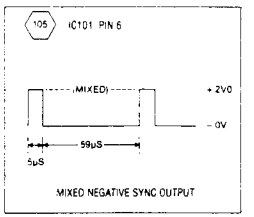
GREEN OUTPUT (CONTRAST MAXIMUM)



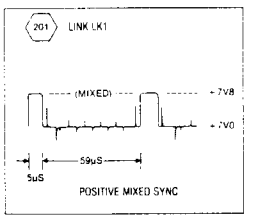
GREEN VIDEO



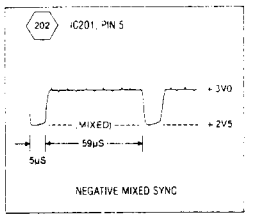
MIXED NEGATIVE TTL SYNC INPUT



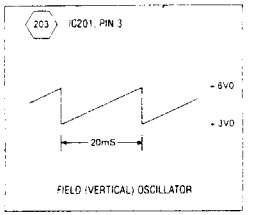
MIXED NEGATIVE SYNC OUTPUT



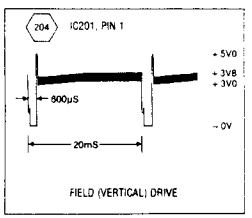
POSITIVE MIXED SYNC



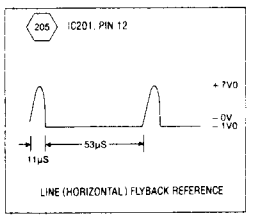
NEGATIVE MIXED SYNC



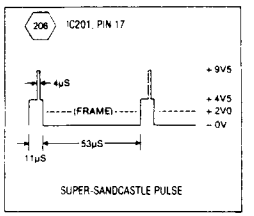
FIELD (VERTICAL) OSCILLATOR



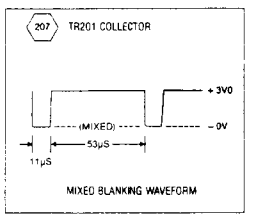
FIELD (VERTICAL) DRIVE



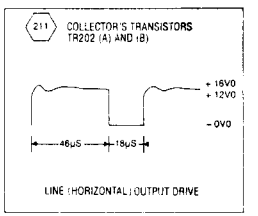
LINE (HORIZONTAL) FLYBACK REFERENCE



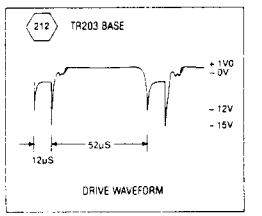
SUPER-SANDCASTLE PULSE



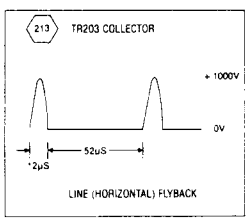
MIXED BLANKING WAVEFORM



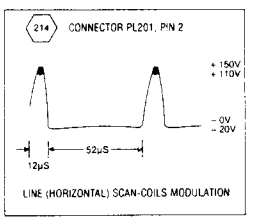
LINE (HORIZONTAL) OUTPUT DRIVE



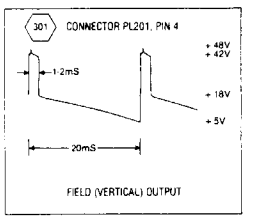
DRIVE WAVEFORM



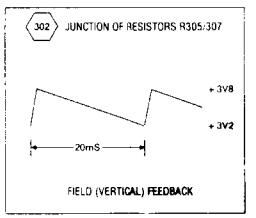
LINE (HORIZONTAL) FLYBACK



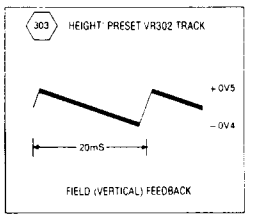
LINE (HORIZONTAL) SCAN-COILS MODULATION



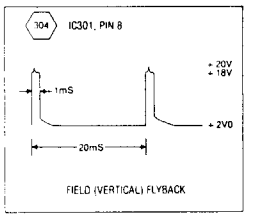
FIELD (VERTICAL) OUTPUT



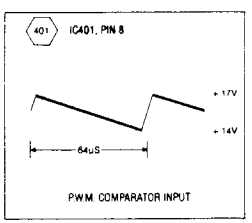
FIELD (VERTICAL) FEEDBACK



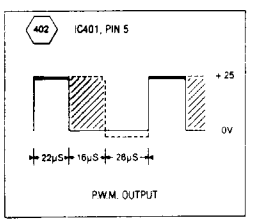
FIELD (VERTICAL) FEEDBACK



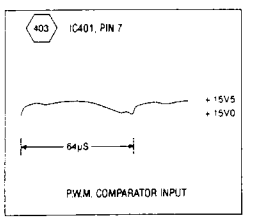
FIELD (VERTICAL) FLYBACK



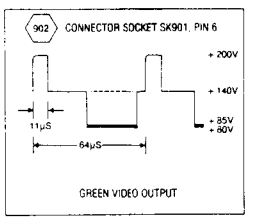
P.W.M. COMPARATOR INPUT



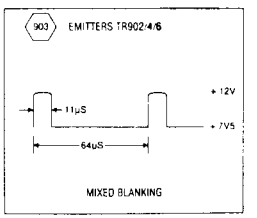
P.W.M. OUTPUT



P.W.M. COMPARATOR INPUT



GREEN VIDEO OUTPUT



MIXED BLANKING

SAFETY AND ISOLATION!

The power supply is always live regardless of the mains supply polarity. Therefore for servicing, the monitor should be supplied through a mains isolation Transformer of at least 300VA rating.
(See 'SAFETY NOTES' in SERIES 4/5 SERVICE MANUAL).

SAFETY CRITICAL COMPONENTS

Components marked ⚠ on the circuit diagram and parts list are safety approved types and should only be replaced with components supplied or approved by our Service Department. It is recommended that other replaced parts should be of the type originally fitted, particularly resistors stood off the printed circuit boards.
FAILURE TO OBSERVE THE ABOVE MAY RENDER THE CHASSIS AND EXTERNAL ACCESSIBLE PARTS LIVE, OR CAUSE OTHER HAZARDS!

INITIAL TEST CONDITIONS

Mains Input: 240 V A.C. ~ 50 Hz.
Contrast Control: Set to Maximum.
Brightness Control (if fitted): Set to Mid-Range.
3 BIT TTL Input: Standard 8 vertical colour bars.
Sync: Mixed Negative TTL levels; C.C.I.R. Timing.

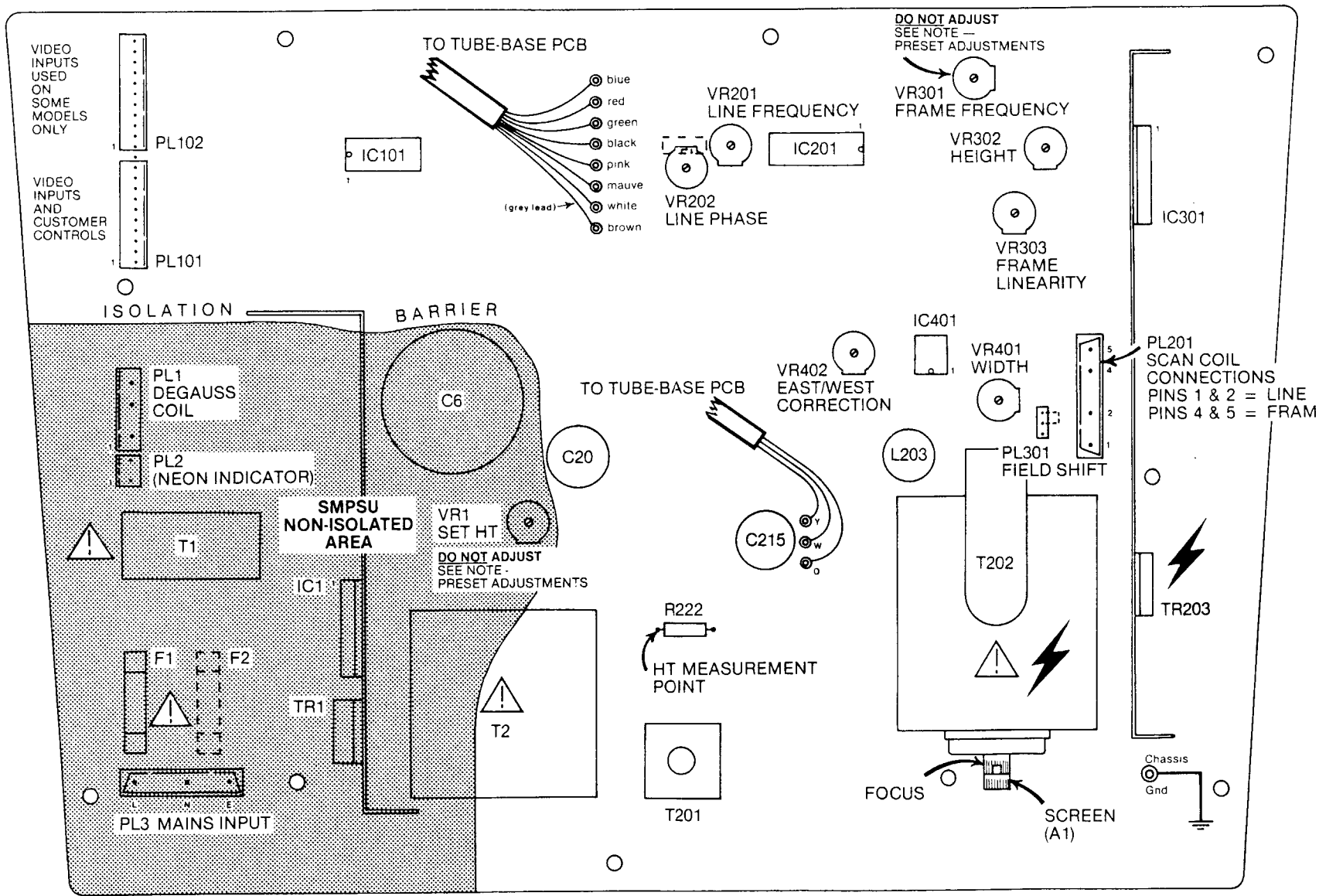
WAVEFORM MEASUREMENT POINTS

Waveform points are denoted thus (3)

1) The numerical reference point on the circuit diagram relates to the corresponding numbered display on the accompanying table.
2) Waveform measurements were made using an oscilloscope of 20MHz minimum bandwidth and a ÷ 10 or ÷ 100 passive probe.
3) NOTE DANGER! For reasons of safety, waveforms (1), (2) and (3) MUST be measured ONLY when using a mains Isolation Transformer.

TYPICAL VOLTAGES - MEASUREMENT POINTS

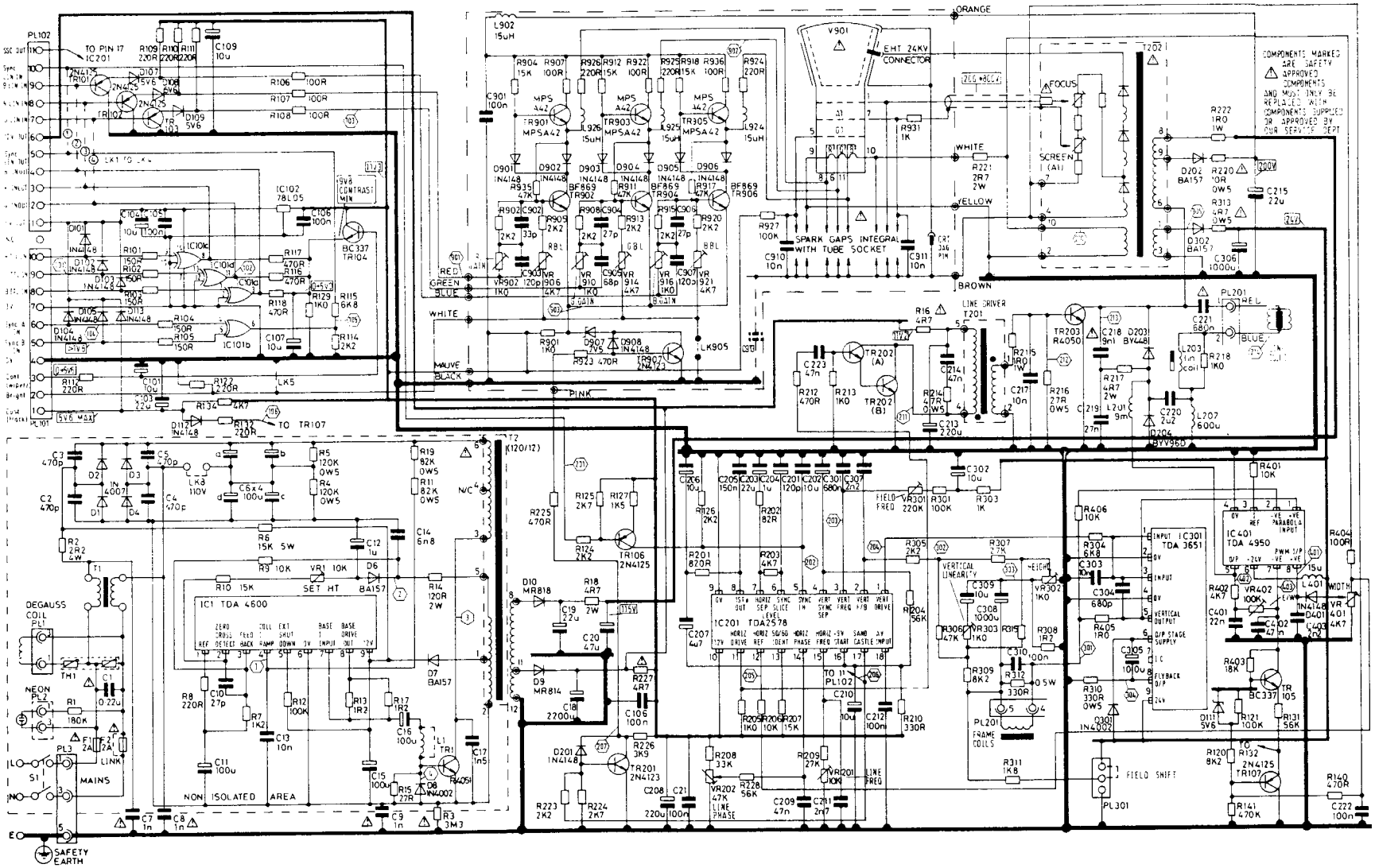
1) Voltages denoted thus 3.0 V on the circuit diagram, are typical voltages only, and were measured using a high input impedance D.V.M.
2) Alternatively, Analogue meters of 20 Kn/Volt minimum can be used.



NOTE: Do not adjust presets VR1 'SET HT' and VR301 'Frame Frequency', BEFORE reading 'Preset Adjustment' instructions.

CAUTION — HIGH VOLTS AREA

SERIES-4 — MAIN CHASSIS PCB PRESET CONTROLS



SERIES 4 MAIN CHASSIS AND TUBEBASE CIRCUIT DIAGRAM